

CANADIAN MACHINE TOOL

AND MANUFACTURING NEWS

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Subscription Price

READ AND PASS TO	Check	See Page	READ AND PASS TO	Check	See Page



"LISTEN FELLERS! QUALITY COUNTS.
I've tried 'em all, and when the Boss says 'I want economy,
efficiency and increased production in this shop', I say,
'give me **RedCut!**'"

"RedCut Superior"



THE NATIONALLY KNOWN—FIRST QUALITY
HIGH SPEED STEEL
THE BEST FOR ALL MACHINE WORK.



VANADIUM-ALLOYS STEEL CO.
MAIN OFFICE AND WORKS: LATROBE, PA.

— BRANCHES —
INDIANAPOLIS BOSTON CLEVELAND PITTSBURGH CINCINNATI DAYTON NEW YORK
BUFFALO PHILADELPHIA CHICAGO TORONTO DETROIT MEMPHIS ERIE ROCHESTER
(WAREHOUSE) (WAREHOUSE)

YOUR COPY OF THE **RedCut** BOOK IS READY—WRITE FOR IT.

CANADIAN MACHINERY

SMALL TOOLS

Pratt & Whitney Adjustable Blade Reamers

These reamers have eccentric relief and can be set to size without regrinding. They are unexcelled for design and simplicity and ease of adjustment.

The eccentrically relieved blades are stronger than others, do not chatter, and produce a smoother hole. The hand, shell and fluted chucking reamers have interchangeable nuts, screws and wrenches. The bottom of a hole can readily be faced.


By a simple adjustment of the blades the reamer can easily be set to size, without regrinding.

Prompt service is assured at our nearest store, where P. & W. Small Tools are carried in stock for immediate delivery. Place your order there to-day.

PRATT & WHITNEY CO. OF CANADA, LIMITED

Works: Dundas, Ontario

MONTREAL	TORONTO
723 Drummond Bldg.	1002 C.P.R. Bldg.
WINNIPEG	
1205 McArthur Bldg.	
WINDSOR	
Davis Building	
VANCOUVER	
B.C. Equipment Co.	
HALIFAX	
Roy Building	



**PRATT
AND
WHITNEY**

The BERTRAM MACHINE TOOLS Page



No. 4 Double Punch and Shear

Belt Drive. 18" Throats.

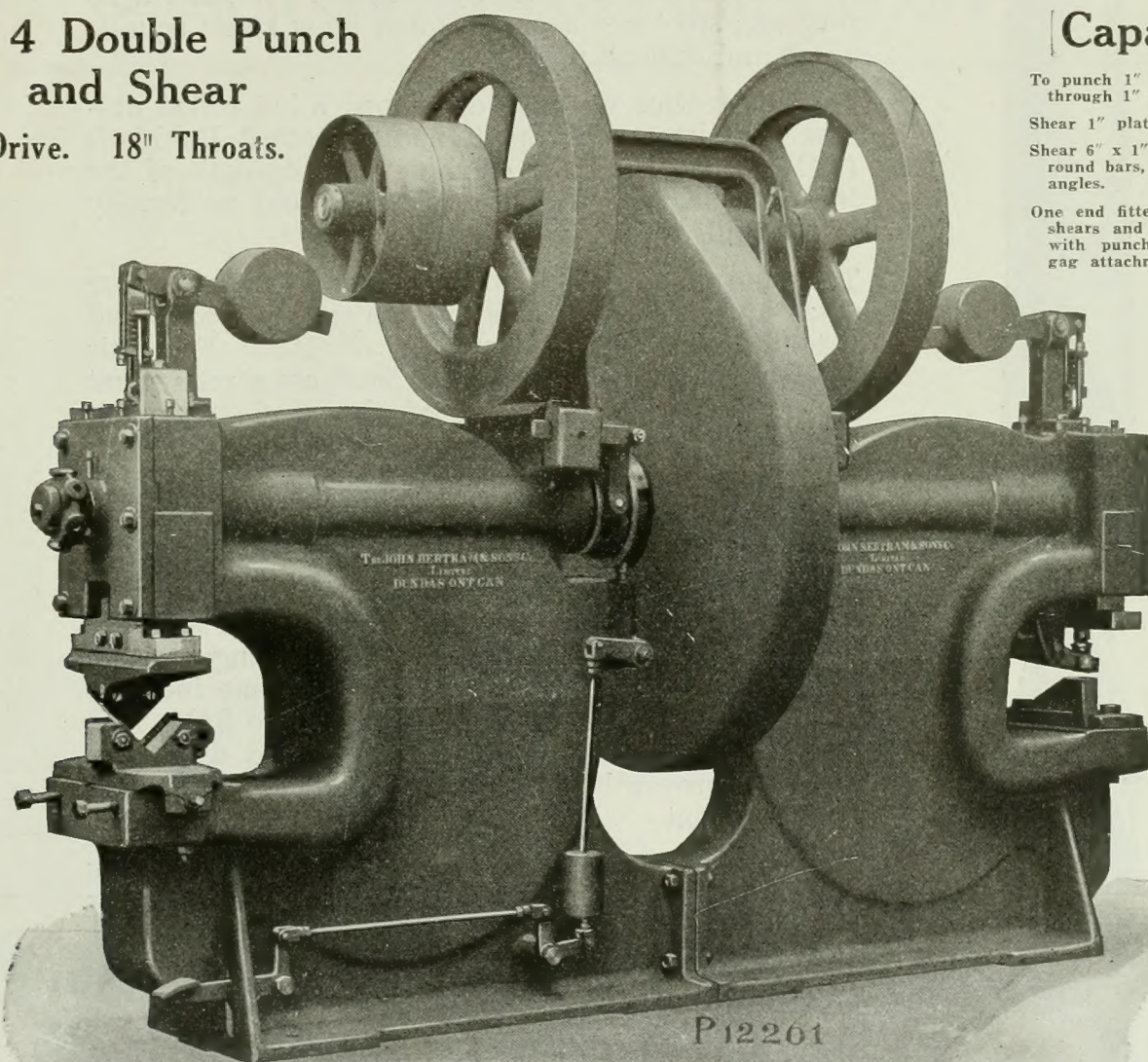
Capacity

To punch 1" diameter holes through 1" plate.

Shear 1" plate.

Shear 6" x 1" flat bars, 1 3/4" round bars, 4" x 4" x 3/8" angles.

One end fitted with Angle-shears and the other end with punching tools and gag attachment.



The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

VANCOUVER
609 Bank of Ottawa Bldg.

WINDSOR
Davis Bldg.

WINNIPEG
1205 McArthur Bldg.

HALIFAX
Roy Bldg.

The New Canadian-Detroit Double-D Rolled Drill

Made in Canada



PRODUCTION requirements in an ever-increasing number of plants necessitate the use of a strong, accurate drill, specially designed for hard drop forgings, steel castings, and other alloy steels equally tough and difficult to drill.

For this service we have developed a hot rolled process drill known as the Canadian-Detroit Double-D (DD) Rolled Drill. It combines the strength of the forged type drill with the accuracy and uniformity of the milled type.

The flute of the DD is formed straight from the bar stock by successive passes through specially built and patented rolls at a temperature of 1850° F. This mechanical rolling of the flutes produces a refinement and uniformity in the grain of the steel and gives additional density at the centre and at the outer edge. Each drill is rolled separately, and the rolls are so designed and operated as to produce the same uniform increase in web thickness as is obtained in high-grade drills of the milled type.

The fluted drill is reheated and twisted in a specially designed automatic machine. The twisting process is held absolutely uniform, giving the same increase in helix angle from shank to point, 27° to 32°. This standard has been adopted on our milled drills and has been proven by exhaustive experiments to be the most efficient.

The DD has increased production and cut drilling costs in many of the finest plants in Canada. A fair test will convince you.

Manufactured and carried in stock at Walkerville in all sizes from 1/2 inch to 1 1/2 inches.

We also manufacture and carry in stock all sizes and types of high speed and carbon milled drills.

CANADIAN-DETROIT TWIST DRILL COMPANY, LIMITED

Walkerville, Ontario

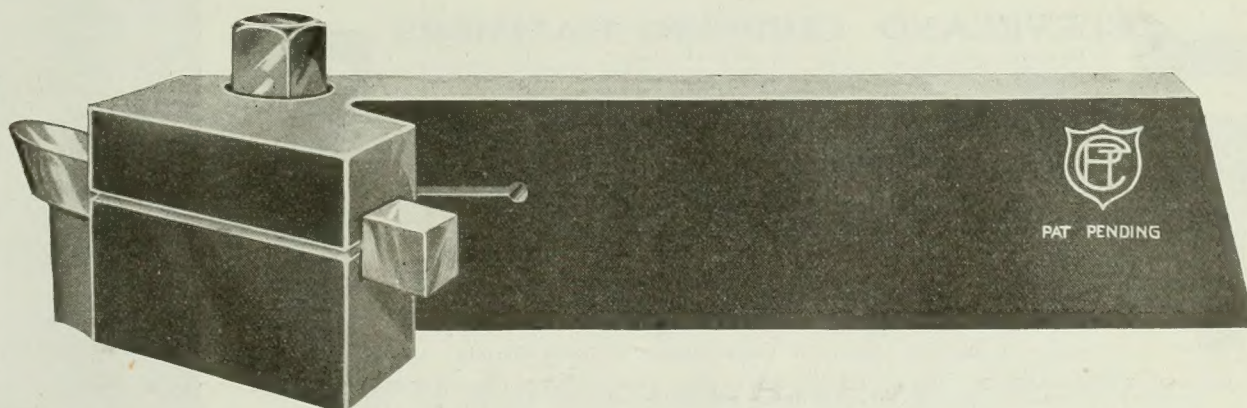
CANADIAN PRODUCTION TOOL COMPANY LIMITED

WALKERVILLE, ONTARIO, CANADA

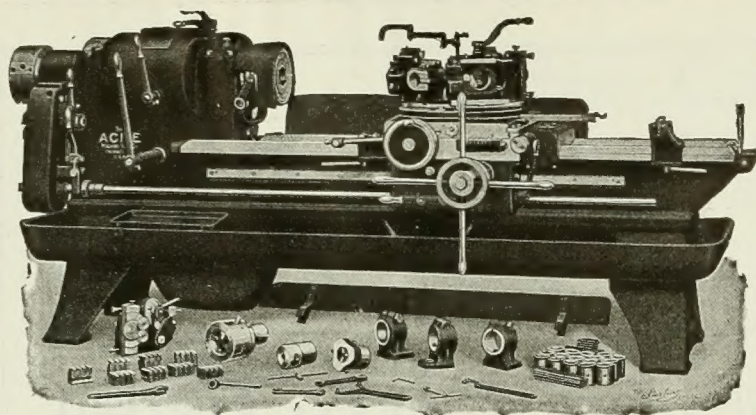
Manufacturers of High Grade
Tool Holders

*Write for
Catalogue*

Left Hand Square Turning Tool Holders



Made of Tool Steel and Tempered



Cincinnati Acme

Cincinnati Acme Turret Lathes are adapted to both bar and chucking work. We offer a full line for your every requirement.

Don't Merely Ask for Efficiency—Get It!

Have you often wondered why production sometimes falls a little behind on certain jobs? Perhaps it's your lathes.

Cincinnati Acme Turret Machinery will give fast, accurate and economical production. Once installed in your shop you will find that their double purpose features and sturdy, rigid construction save power and get your work out ahead of schedule.

Writing us a postcard may be your first step toward increased production and greater lathe economy.

The Acme Machine Tool Company CINCINNATI, OHIO, U.S.A.

Canadian Agents: Rudel-Belnap Machinery Co. of Toronto and Montreal

Cleveland Sand Rammers FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Foundry Ramming.

The Piston Rods are packed with a resilient packing which prevents any dirt from entering piston chamber and working parts—They are fitted with either Round or Flat Rod as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.

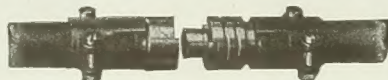
CLEVELAND CHIPPING HAMMERS

For Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are adapted for fast chipping now required by piece-workers.

CLECO PRESSURE-SEATED AIR VALVES AND BOWES AIR HOSE COUPLINGS

Are Standard Equipment Everywhere
Both Valves and Couplings are pressure tight.

Bowes Couplings are instantly connected or disconnected.



Bowes Couplings are absolutely air tight under all pressures.

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

IN STOCK:—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, PRESSURE-SEATED AIR VALVES, ETC.

Write for Bulletins 44-46-48 and 49.

ADDRESS ALL INQUIRIES TO:

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 CHESTNUT STREET, TORONTO, ONT.

337 CRAIG ST. W., MONTREAL, QUE

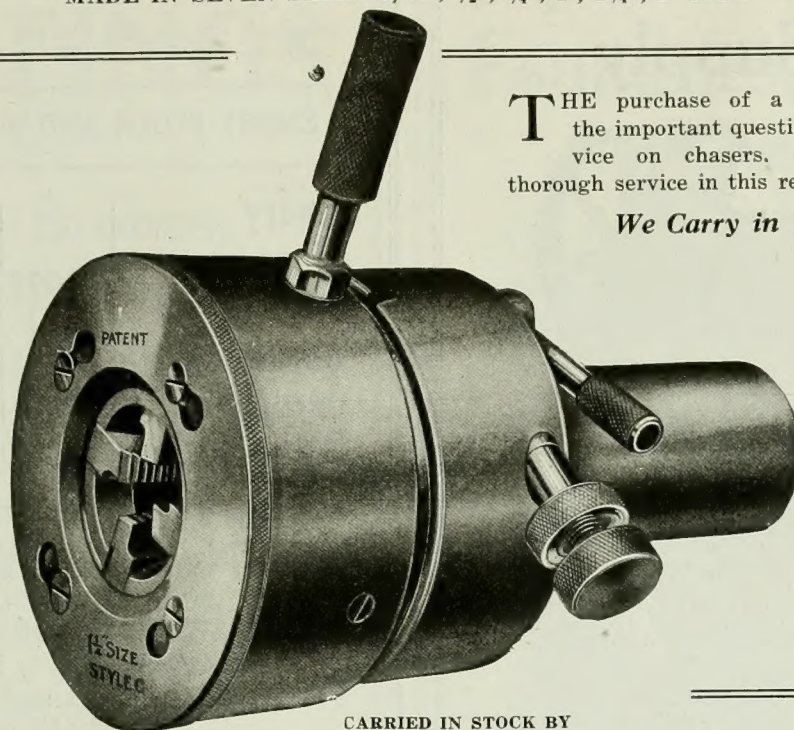




The [Coventry Patent Self-Opening Diehead

MADE IN SEVEN SIZES—5/16", 1/2", 3/4", 1", 1 1/4", 2" and 3"

THE Coventry Diehead produces clean smooth threads, accurate in form and pitch. The Coventry chaser grinding system ensures exceptional life to the chasers and the greatest ease in grinding, all chasers are ground together on any type of surface grinder.



THE purchase of a diehead involves the important question of prompt service on chasers. We offer very thorough service in this respect.

We Carry in Toronto Stock

Chasers With
U.S. Standard
Thread
Briggs Pipe
Thread
A.S.M.E. Thread
S.A.E. Thread
Whitworth Thread

Section H. describes our Diehead and Chaser Grinding System in Detail. A copy will be sent on request.

CARRIED IN STOCK BY

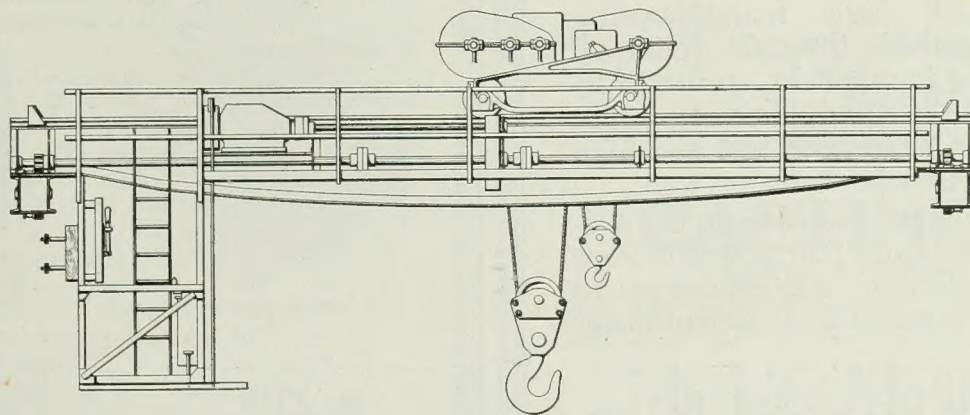
ALFRED HERBERT LIMITED

1-3 JARVIS STREET, TORONTO



CRANES

ELECTRIC AND HAND OPERATED

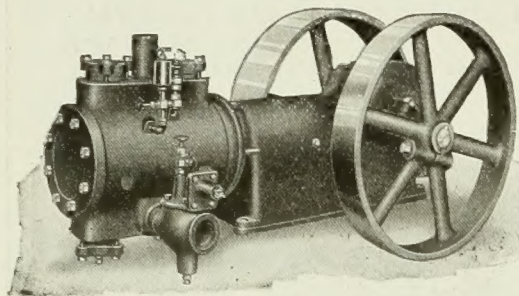


DOMINION BRIDGE COMPANY LIMITED

HEAD OFFICE & WORKS: MONTREAL

BRANCHES:—OTTAWA, TORONTO, WINNIPEG

For Your Shop Air Supply



Class "EL-1" Single Stage, Straight Line, Power Driven Compressor has a higher capacity for weight and floor space than other machines of its type on the market and is characterized by such worthwhile features as entirely enclosed dust-proof frames, automatic lubrication at all speeds, silent leaf valves, etc. Specially adapted to short belt motor drives. An ideal unit for the small shop or as an auxiliary in larger plants. Smaller sizes shipped from stock. Fully described in Bulletin K-300-C.

An unfailing supply of compressed air is a manufacturing necessity in these days of keen competition and close buying.

The installation of a Canadian Ingersoll-Rand Compressor is the simplest and best means of establishing a satisfactory air service in your plant. Made in a score or more sizes and styles, there is one for every air compressing need and for every type of drive.

Perfect design, modern production methods and high manufacturing standards gained through years of specialization in this field, ensure satisfaction from the standpoints of prompt shipment, moderate first cost and high operating economy.

Whenever you are planning on the provision or extension of air power in your shop you will want our catalogues at hand for consultation. Better send for them now.

CANADIAN INGERSOLL-RAND COMPANY, LIMITED

Sydney Sherbrooke Montreal Toronto
Cobalt Winnipeg Nelson Vancouver

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

EMERY FLOUR AND WASHED FLOUR

Emery Glass Flint Garnet Corundum Carborundum	} Paper and Cloth	In
		Sheets, Rolls,
		Discs, Bands,
		Strips and Tapes, &c.

JOHN OAKEY & SONS LIMITED

WELLINGTON MILLS
LONDON, S.E. 1, ENGLAND

AGENTS:
F. Manley, 343 Garry St.
Winnipeg, Man.
Sankey & Mason
839 Beatty St., Vancouver



MOTOR TRUCKS

On a Steep Hill With a Heavy Load

THE driver has got to shift gears in a hurry. That is the time he is glad the truck has a Mapleleaf transmission in it.

For Mapleleaf transmissions have ample multiplying power. The 5 ton model, for example, multiplies 6 times on lowest speed and gives two other changes between that and high. Enough to overcome any hauling problem you will run up against, isn't it!

All changes are made simply and easily. The gears change quietly and effectively. The whole transmission system is of the most rugged type imaginable.

Let us show you a Mapleleaf truck winning an argument with a wicked hill. You will know we haven't said all we might about the merits of its transmission.

MAPLELEAF MFG. CO., LIMITED
MONTREAL, CANADA

GREY IRON CASTINGS

Also

**Brass, Bronze,
Aluminum, Copper,
Zinc and Nickel
Castings**

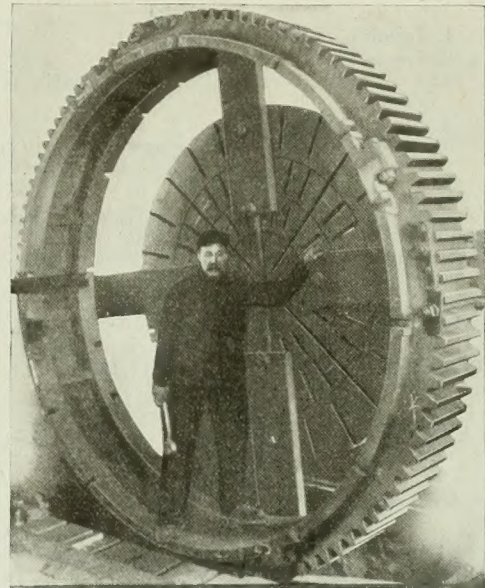
**QUALITY!
SERVICE!**

**Canadian Hanson and Van
Winkle Co., Limited**

Toronto - - - Canada

Hull Iron and Steel Foundries, Limited

HULL, QUEBEC

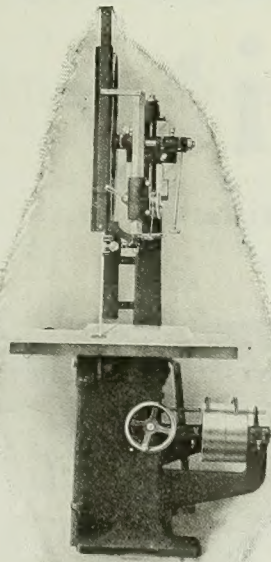
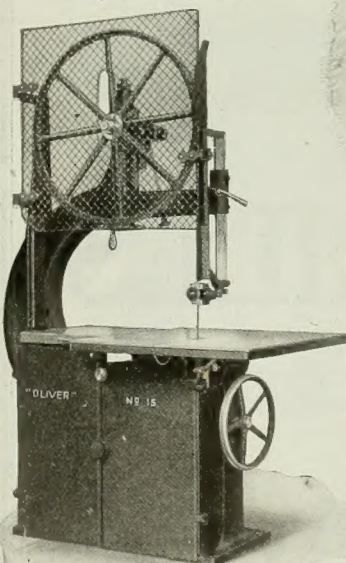


"Oliver" Quality

Pattern Shop
Equipment

Woodworking
Machinery

Engine Lathes



Oliver No. 15 Band Saw

**Oliver
Machinery
Co.**

Grand Rapids, Mich.

Specify "HISCO" Products

Regd.

**Steel, Chrome, Manganese
and Nickel**

STEEL CASTINGS

Annealed and Unannealed

Cement Mill and Mining Machinery, Castings, Stamp Mills,
Crushing Plants, Excavating Outfits, Steel Car Wheels, Loco-
motive Driving Wheels and Frames, etc.

Machine-Moulded GEARS

"HISCO" machine-moulded gears, while requiring no pattern,
insure accuracy, dependability, quality, and the price is minus
the cost of patterns—which in these days of high prices of
lumber and labor is something to be considered.

THE JOHNSON FRICTION CLUTCH

The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

In that it—

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

Adopt the Johnston Lineshaft Drive

The economical, efficient and durable method of power transmission through friction control.

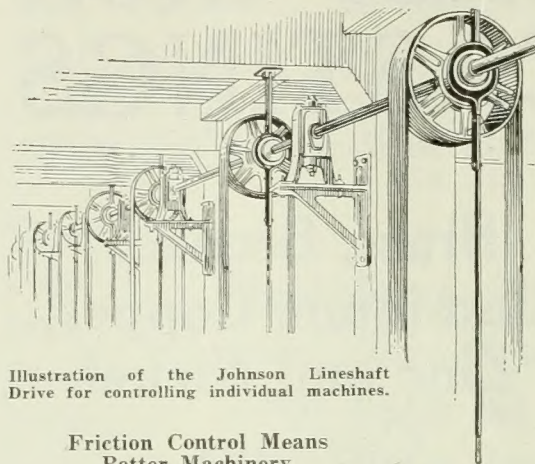
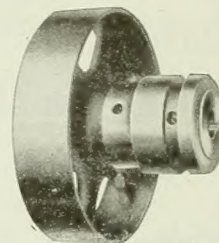


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

Friction Control Means Better Machinery

Whether it is applied overhead or in the machine itself.

Write for our Booklet
"Clutches as Applied to Machine Building"
and our Yellow Catalog.



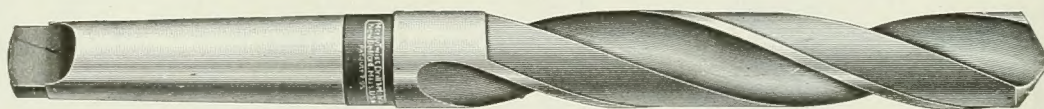
CANADIAN AGENTS:

WILLIAMS & WILSON, LTD., 84 Inspector Street, Montreal
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

Quality

Is the Characteristic
which makes



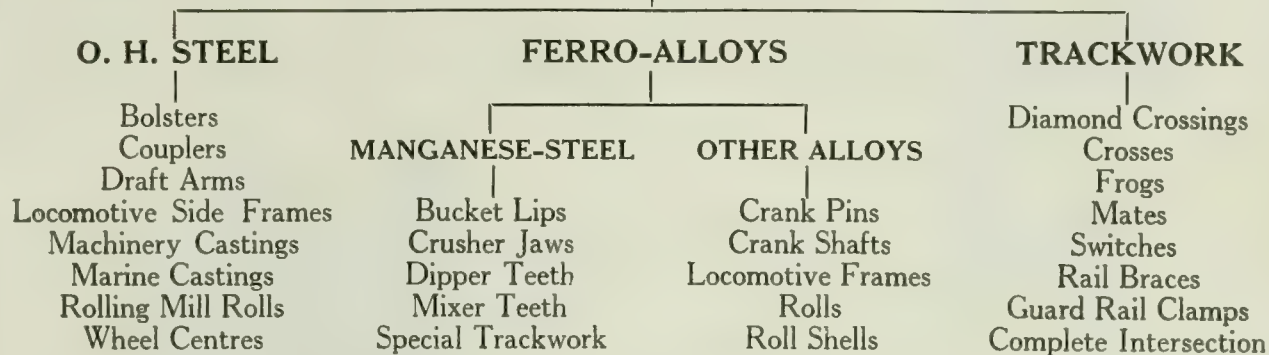
"MORSE" DRILLS

POPULAR

MORSE TWIST DRILL & MCH. CO.
NEW BEDFORD, MASS., U.S.A.

CANADIAN STEEL FOUNDRIES LIMITED

AMONG OUR PRODUCTS



This list is merely an indication

General Offices:

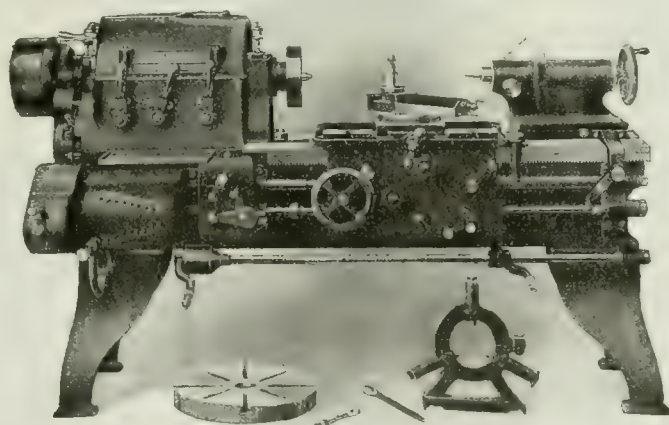
Transportation Building, Montreal

The "Lehmann" Improved Selective Head Lathes

(Patents Pending)

SIZES—14" to 24" SWING

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead and alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only ten gears.

Improved Friction Clutches (Patents Pending) running in oil, requiring no adjustment and giving forward and reverse control to spindle.

Heat-treated or Hardened Steel gears.

All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

Let us describe more fully this Exceptional Lathe and its Distinctive Advantages

Lehmann Machine Company - St. Louis, U.S.A.
Chouteau Avenue at Grand

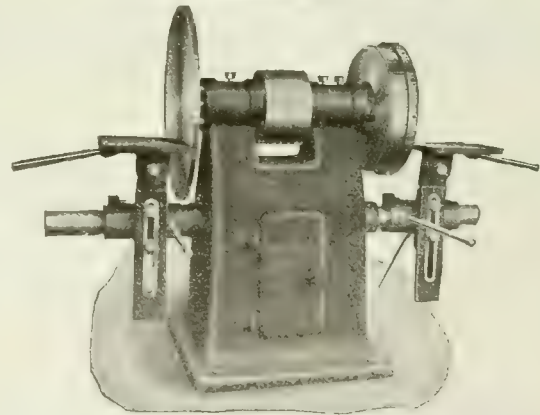
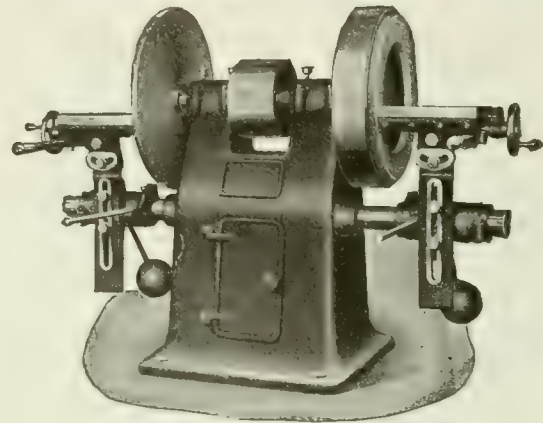
FORD-SMITH DISC Grinders

**High-Class
Made-in-Canada
Machines**

MACHINES which bear a reputation for doing quicker, better work, and whose upkeep expenses are practically nil, merit investigation.

Such machines are Ford-Smith Disc Grinders; every model of the Ford-Smith line—and there's a model for practically every purpose—is designed to give *quality* production as well as *quantity*.

Before leaving the factory all Ford-Smith Grinding Machines are subjected to a series of exacting tests, covering every detail of their construction. These tests *prove* that the machine is capable of filling all our claims.



Many manufacturing operations show possibilities of exceptional economies by the use of suitable grinding processes. Have one of our engineers call and see just what saving grinders would effect on your work.

Any information with regard to Ford-Smith Grinders will gladly be furnished.

Send for our latest Disc Grinder Bulletin.

THE FORD-SMITH MACHINE COMPANY, LIMITED
HAMILTON, CANADA

Foreign Agents:

W. E. Storey, London, England

McLeod & Co., Calcutta, India



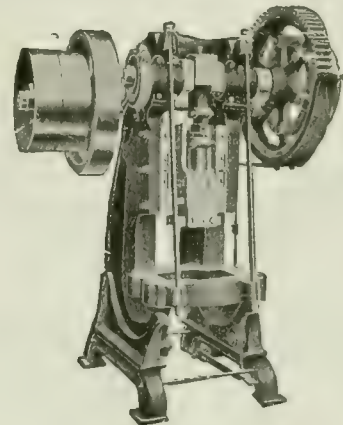
BROWN-BOGGS



B B

RELIABLE

in every sense of the word

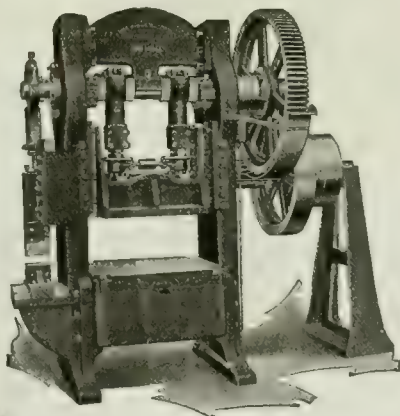


No. 215—Power Press

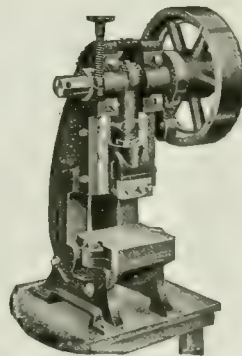
A machine which is always on the job—always willing—is really worth far more than it is usually credited with.

Steady, consistent effort is the only true builder of volume production—effort which utilizes every minute—effort such as you get from all Brown-Boggs machines.

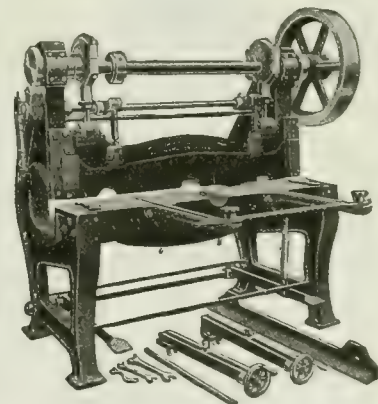
The "B-B" line consists of machines and tools for sheet metal; tinsmiths' tools and machines; presses; dies; shears; punches; drop hammers; canners' processing machinery; evaporating machines and special machinery. We shall be pleased to send you our catalogs containing full particulars of the machines in which you are interested.



No. 140—Double Crank Trimming Press



No. 10—Bench Press



No. 449—Shear



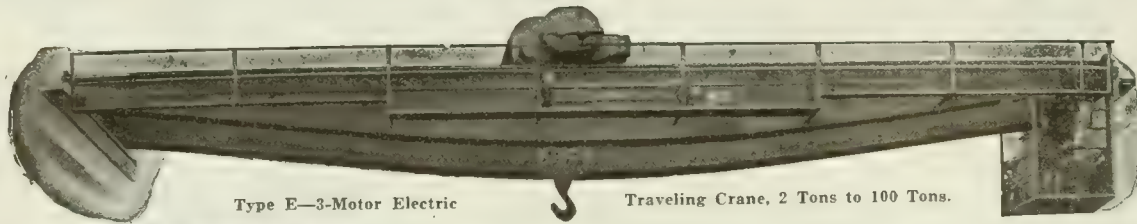
THE BROWN-BOGGS CO., LIMITED

HAMILTON, CANADA.

CANADIAN MADE

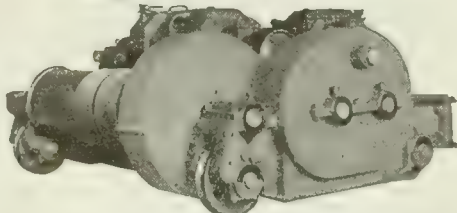
CANADIAN MADE

Electric and Hand Traveling Cranes

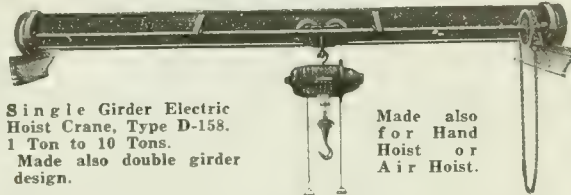


Type E—3-Motor Electric

Traveling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.

Get our prices and specifications before you buy.

In asking prices, state SERVICE CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists— $\frac{1}{2}$ to 10 Tons.

Air Hoists, Trolleys and Tracks



Type No. 20 Air Hoists.

Northern Crane Works, Limited

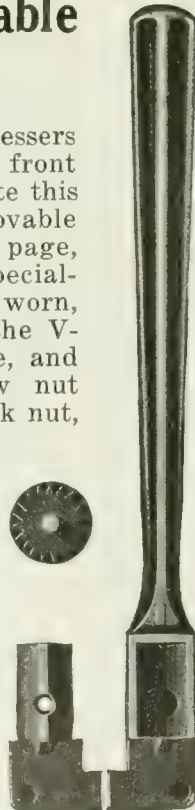
Walkerville, Ontario, Canada

Desmond Removable Jaw Dresser

The wear on Huntington Dressers is at the "nose," directly in front of the bushings. To obviate this trouble the Desmond Removable Jaw Holder, shown on this page, was designed. When the specially hardened jaws become worn, a new set is adjusted in the V-shaped sides of the handle, and held in place with a jaw nut placed over the countersunk nut, thus renewing the dresser.

Write for catalog of our complete line of dressers and accessories.

The Can. Desmond-Stephan
Mfg. Company, Limited
Hamilton, Ontario



$\frac{1}{3}$ to $\frac{1}{2}$ Reduction in Milling Cost

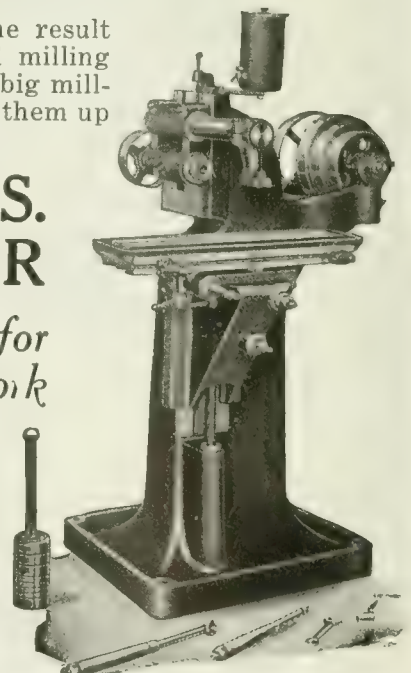
This will be the result of taking small milling jobs from your big millers and putting them up to

The U.S. MILLER

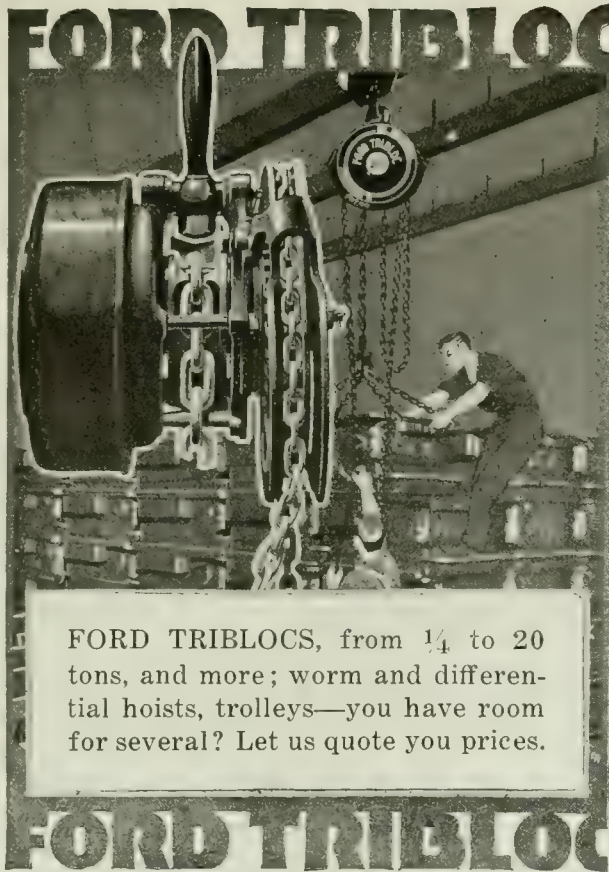
The Miller for Small Work

A small machine takes up less space, requires less power, is easier to operate and is more accurate.

The Paramount Miller of its size. Drop us a line for full details.



United States Machine Tool Company
Cincinnati, Ohio, U.S.A.



FORD TRIBLOC

FORD TRIBLOCKS, from $\frac{1}{4}$ to 20 tons, and more; worm and differential hoists, trolleys—you have room for several? Let us quote you prices.

FORD TRIBLOC

Dog tired? No!

Their burden is carried by a FORD TRIBLOC.

These men do not work with the blind force of a gang of ignorant hunkies. They're strong men, but their strength is directed—their efforts are centered in **placing** the loads.

Men are fond of the TRIBLOC. They work under it, over it, relying on it with perfect confidence. They know it will not fail. They work it from any angle, at high speed, for they find that the hand chain will not "gag" or override the hand wheel flange. Familiarity has bred **respect**.

FORD CHAIN BLOCK CO.
2ND & DIAMOND STREETS PHILADELPHIA, PA.

OVER SEAS REPRESENTATIVE



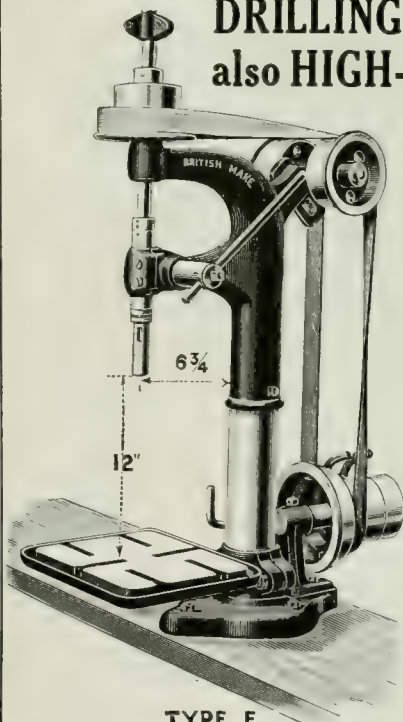
ALLIED MACHINERY COMPANY OF AMERICA
51 CHAMBERS ST. NEW YORK, U.S.A.



PARIS BRUSSELS TURIN BARCELONA RIO DE JANEIRO

2181-D

SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS



TYPE E.

TEN DIFFERENT
TYPES, ALL
FROM STOCK

Telegrams:—
"BEACO TIPTON"
ENGLAND

Telephone:—
90 TIPTON

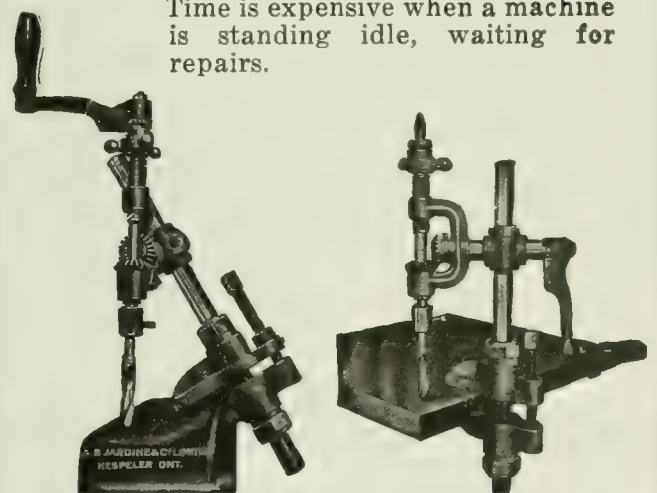
Code used:—
ABC 5th EDITION

**AGENTS
WANTED**

Beacon Engineering Co.
TIPTON, ENGLAND

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, \$26.50 net.

Sold by all Machinery and Supply Houses.

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO



Williams' Superior Drop-Forged Wrenches

It's great to be able to "lean" on your wrench and give a husky, full-arm swing, secure in the knowledge that it will stand any strain that may be applied. It's confidence that the wrench is dependable that makes the work a pleasure and the tightening-up job real play.

Williams' Superior Drop-Forged Wrenches are regular "he" wrenches; they do a man's work in a man's way; they take the hard with the easy jobs, as they come; they do not round and batter the corners of nuts and cap-screws, because they fit; neither do they slip, for the same reason.

There's a Williams' Wrench for every purpose—40 Standard patterns in nearly 1,000 sizes with openings from 3-16 to 7 5-8 inches. Also Screw Wrenches, Adjustable Wrenches, Stillson Wrenches, "Bull Dog" Wrenches, Auto Wrenches, Chain Pipe Wrenches, etc., etc. Ask your dealer.

Wrench Book on request.

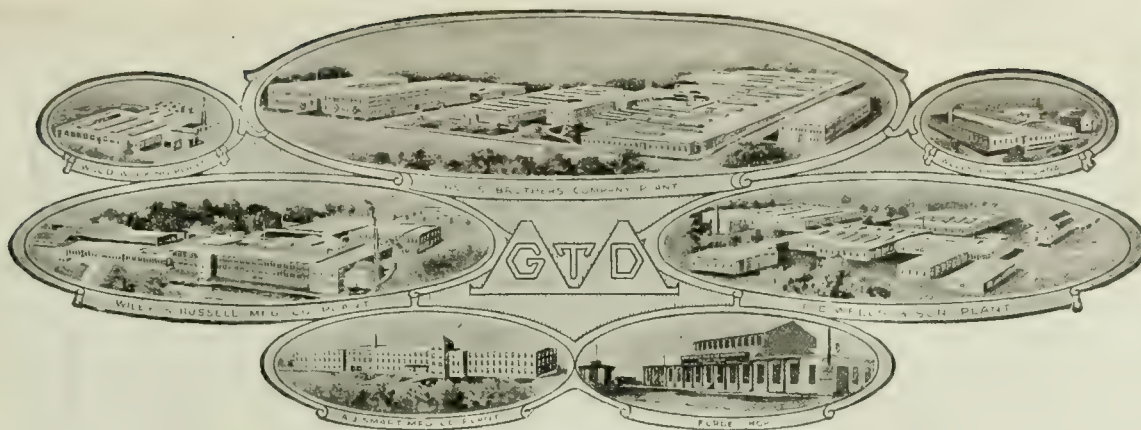
J. H. Williams & Co.

LIMITED

"The Wrench People"

FORMERLY CANADIAN DIVISION OF
THE WHITMAN & BARNES MFG. CO.

45 Thorold Road, ST. CATHARINES, Ontario



Why should I buy GTD Taps and Dies?

As you turn the pages of the magazines and note the many advertising announcements—you must often have asked this question:

“Are all taps and dies alike?”

If they are, then your decision is influenced mainly by the attitude of the people who make them—their friendliness, their understanding of your needs, and their aggressiveness in urging you to buy their product instead of some other.

If taps and dies are *not* alike, how do they differ?

Take the matter of metal buying—or heat treatment, or uniformity in production. Some products excel over others in each case. Or consider accuracy, rapidly becoming a first consideration in buying taps and dies. Or such elements as adaptability or application!

Consider GTD with these fundamental differences in mind. Think of the tap and die specialties now so universally

used which are ours and were first made by us:

The Button Die
The Round Adjustable Split Die
The “Little Giant” Die
The “Acorn” Die
The “Gun” Tap
The “Maxi-Staybolt” Tap, etc.,

In all of these tools there are *differences* which distinguish them from taps and dies so often thought of as “all alike.”

Back of these differences is the pioneer work in screw-cutting tool manufacture, of Wiley & Russell, Reese, Wells Brothers—names that have stood and still stand for the painstaking effort that only real genius gives to its task.

No, taps and dies are not all alike. There are differences that most observers can detect. And these differences which make it worth any tool-user's while to look for the GTD trademark and *insist on it*—are the things on which our advertising and our salesmanship put the emphasis.

Screw Thread Text Books Free

Our catalogs and descriptive booklets on GTD threading tools are really text books on the subjects they cover and as such are valuable to any shop worker or executive. Let us mail them to you without cost. Use the coupon and indicate whether you are using production or repair tools or both.



Successors to Wells Bros. Co. of Canada, Ltd., Galt, Ontario

GTD Screw Plates, Taps, Dies,
Reamers, Gages, Pipe Wrenches

GTD

Corporation
of Canada, Ltd.
Galt, Ontario

Send your threading
tool catalogs and
booklets giving infor-
mation about

☐ Production Threading
Tools
☐ Repair Threading Tools

Name _____

Position _____

Firm _____

Address _____

CM 205

BUTTERFIELD

TAPS, DIES, DRILLS, REAMERS and MILLING CUTTERS

BUTTERFIELD — “The Tools You Buy Again”

The quality and reliability of our product is assured and guaranteed by our long experience. We have been manufacturing Cutting Tools for forty years and during that time have built up a reputation, not only in Canada but throughout the industrial world for high quality tools—tools you buy again.

BUTTERFIELD & CO. Division

Union Twist Drill Co.

ROCK ISLAND, QUE., CANADA

STORES—220 King Street West, Toronto.

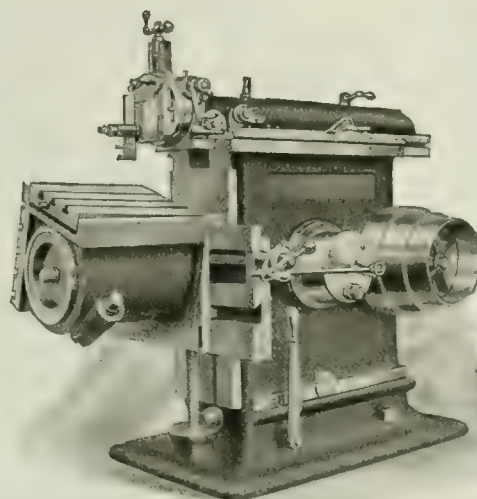
131 St. Paul Street West, Montreal.

AGENTS—D. Phillip, 138 Portage Ave., Winnipeg, Man.

The Triangle Co., Standard Bank Bldgs., Vancouver, B.C.

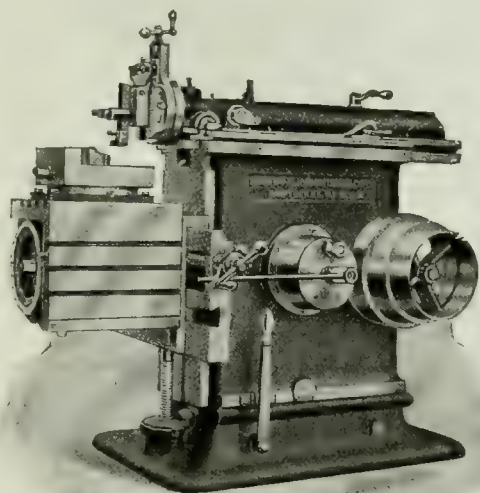
FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander, 83-84 Coleshill St., Birmingham, England; France, Italy, Belgium, and Switzerland, Fenwick Freres, 9 Rue de Rocroy, Paris; Sweden, Norway, and Denmark, Ab. Sigfr. Anderson & Co., Malmö; Spain, Casamitjana Hermanos, Barcelona; Japan, Abe-Kobei & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmolen & Hausman, Rotterdam; Australia, H. R. America, Charles Dreyfus, B. Mitre 785, Buenos Aires, R.A.; South Africa, H. Parker Wood, Cape Town, Durban and Johannesburg.

UNIVERSAL SHAPING MACHINES



No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work, Tool Making and General Manufacturing.



Machines regularly furnished with—

Swivelling Graduated Table,
Auxiliary Tilting Side for Compound
Angles,
Power Down Feed on any angle, with any
variation of feed,
Automatic Feed Stop,
Graduated Collars on Tool Head Feed
Screw and Table Feed Screw,
Swivel Vise and Graduated Base,
Table raised and lowered by power on
24-in. size.

We carry large stocks of our 15-inch and 24-inch shapers in
our Toronto show rooms—all ready for immediate shipment.

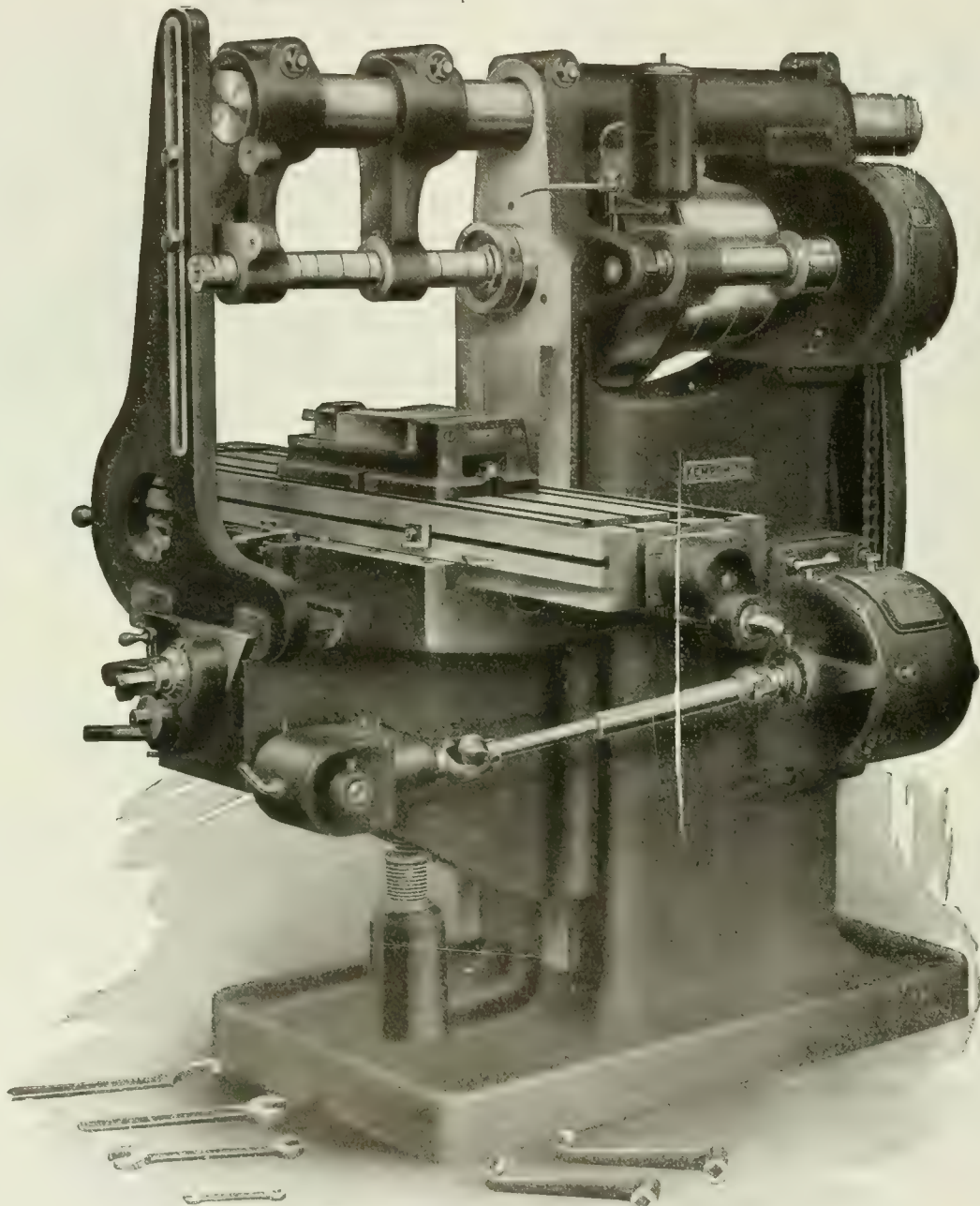
Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., Limited

Head Office and Showrooms:

11 Wellington Street East, Toronto, Canada

KEMPSMITH



KEMPSMITH No. 3 Plain Milling Machine

Double Back Gear

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kemp Smith Miller. Write for a copy to-day.

THE KEMPSMITH MANUFACTURING CO.
MILWAUKEE, WIS., U.S.A.

FOREIGN DEALERS:—American Trading Co., 25 Broad Street, New York, N.Y. (Japan); Barandiaran & Co., 3-Alameda, San Sebastian, Spain; Bevan & Edwards Pty., Ltd., 117 King Street, Melbourne, Australia; Blair, Reed & Company, Nathan's Bldg., Wellington, N.Z.; Bloxham, Edgar, 12 Rue Du Delta, Paris, France; 245 W. 12th St., New York City; L. S. Devos, Grand Central Palace, New York City; Herbert, Alfred, 54 Dey Street, New York City; Nielsen & Winther, Blegdamsvej 60, Copenhagen, Denmark; 24 Stone Street, New York City; Parke & Lacy Co., 60 Clarence Street, Sydney, N.S.W., Aust.; Selson Engr. Company, 85 Queen Victoria St., London, E. C., England; Corso Vittorio Emanuele, 11, No. 4, Turin; 5 Piazza Castella,

Milan, Italy; 24 Stone Street, New York City; Pascual Teja, La Capuchinas, No. 65, Mexico, D.F.; Spliethoff, Beeuwkes & Co., Leuvehaven, W.Z. 159, Rotterdam, Holland; Turner, Hoare & Co., Ltd., Lansdowne Road, Post Box No. 195, Bombay, India; Charter & Gardiner, 55 Calle Echaque Santa Cruz, P. O. Box 1201, Manila, Philippine Is.; Societe Anonyme Belge Alfred Herbert, Rue De Laeken, 35a & 35b, Brussels, Belgium.

CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Canadian Hart Wheels



Choosing the RIGHT Wheel!

By using the right wheel for the job it is possible to save a good deal of time and expense in your grinding operations. It takes a lot of experience and practice to choose the wheel of correct grade and grain. Tell us the class of work and we'll tell you the wheel you should use.

Canadian Hart Products Limited

Hamilton, Canada



*Made
In Canada*



A BOY, operating this "BLISS" No. 19 Inclinable Press for THE KIRBY MANUFACTURING CO., "TOYS WITH BELLS," MIDDLETOWN, CONNECTICUT, is able, regularly, to close 15,000 two-piece, cold-rolled steel sleigh bells per 10-hour day.

The dial feed arrangement makes practicable this extremely rapid production. This press has been operating 10 hours per day since 1906 without the replacement of any part.



1857

E. W. Bliss Company

Main Offices: BROOKLYN, N. Y., U. S. A.

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ST. LOUIS, Boatmen's Bank Bldg.

CLEVELAND, Union Bank Bldg.

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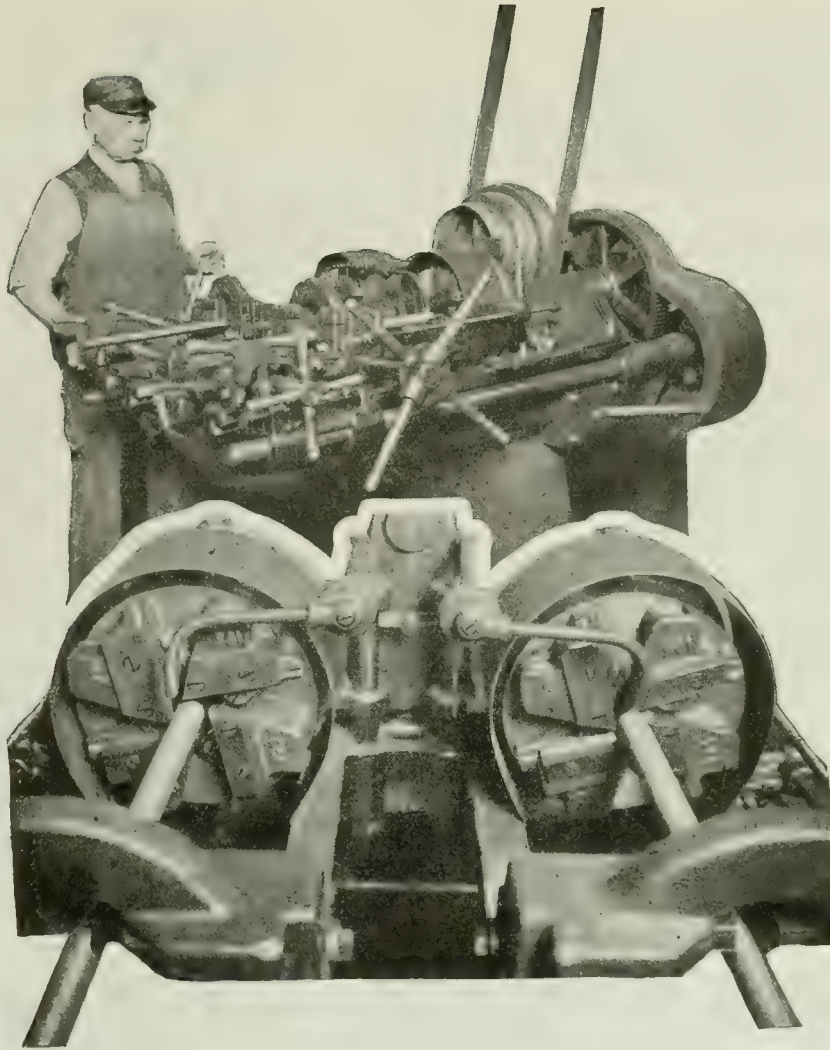
LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E.

PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen



1921

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THE LANDIS Ideal for Staybolt Threading

The above Landis Threading Machine photographed at the plant of the Bigelow Company, New Haven, Conn., has been in operation for three years, during which time it has seen steady service, threading 1 $\frac{1}{8}$ -in. stock for staybolts.

At no time have they been forced to cease operation on this machine owing

to repairs, etc. The use of Landis Threading Machines, with their sturdy construction and superior type die head, has proven that "Landis" means more threads per hour, more hours of threading, and the consequent "more threads per dollar."

Be guided by "Landis" performance of "More threads per dollar."

Write for information

Landis Machine Co., Waynesboro, Pa., U.S.A.

Exclusive Canadian Agents: Canadian Fairbanks-Morse Co., Limited



HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

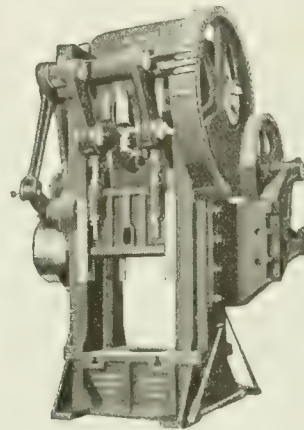
Twist Drills, Taps, Hack Saw Blades, Milling Cutters,
Files, Etc.; Music Wire for Springs, Steel Balls,
Cold Rolled Tool Steel in Strips and Sheets,
Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY,
LIMITED
332 St. James Street, Montreal

Sole Agents for
JONAS & COLVER, LIMITED
 Novo and Continental Steel Works
 Sheffield, Eng.

H. BOKER & CO., Inc.
 New York, N.Y.

The “TOLEDO”



Toggle Drawing PRESSES

The steady reliability of these presses is responsible for the noticeably increased production which they make possible. This fact and their low cost of upkeep has made them a success to every user.

The patented toggle mechanism is simple and effective.

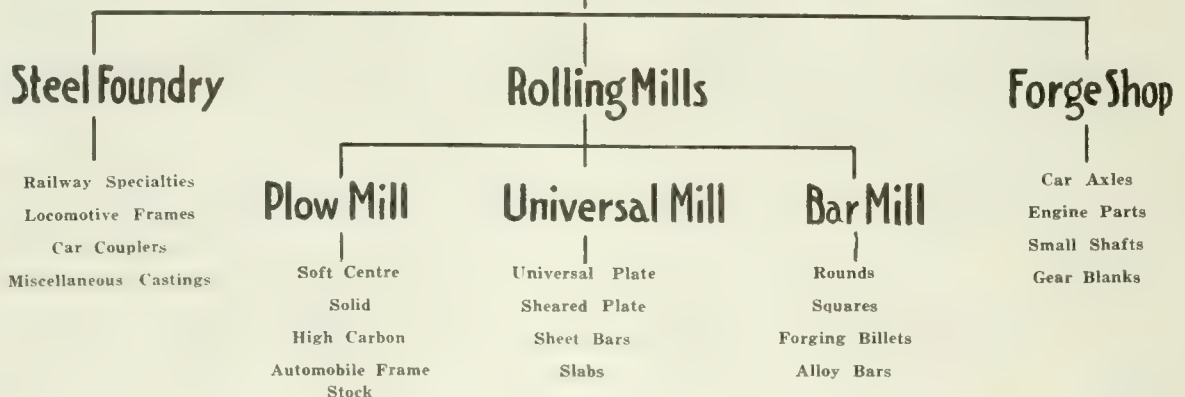
This is but one of our presses; altogether we make presses for every use. Shall we send you full particulars of those designs in which you are interested?

THE TOLEDO MACHINE & TOOL CO.
TOLEDO, OHIO

DOMINION FOUNDRIES and STEEL LIMITED

Furnaces

Open Hearth, Electric and Alloy Steel



Complete Machine Shops, Chemical and Physical Laboratories
HAMILTON, ONTARIO

LA SALLE

Has an Advantage
Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability. The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding
1/4" to 2 1/4". Also
1/8" to 3 1/2" dia.

LA SALLE TOOL CO.
La Salle, Illinois, U.S.A.

Represented in Canada by
A. R. Williams Machinery Co., Ltd.
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver

WHY EXPERIMENT ?
WE DID IT FOR YOU YEARS AGO



IMPERIAL GENUINE



For Heavy Engines and
Extraordinary Hard Work

HARRIS HEAVY
PRESSURE

THE
COPPER COATED
CAKE

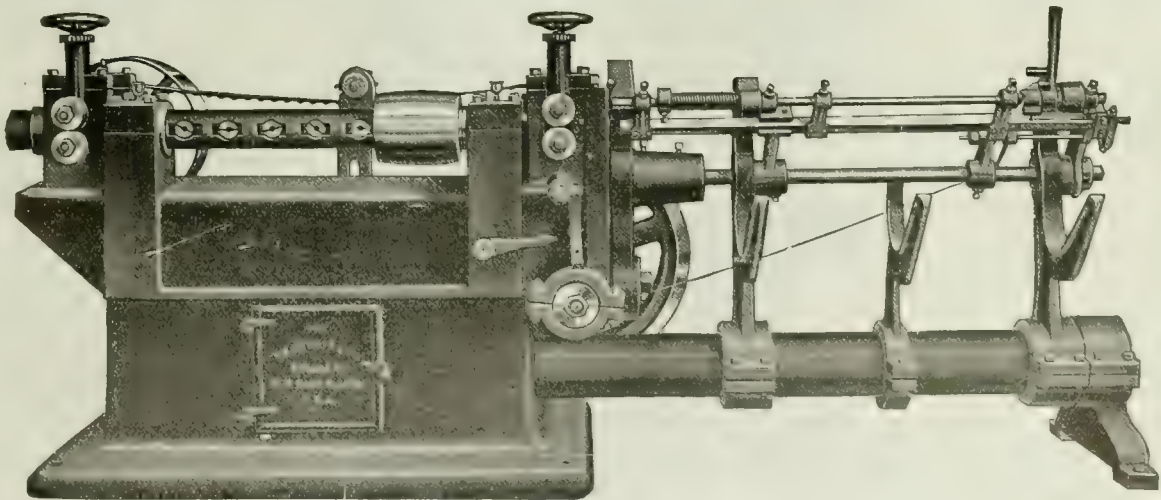
For Donkey Engines, Saw Carriages, Small Motors,
Transmission Line Shafting and all steady heavy
pressure duty.



Matchless

Suitable For Slow-Moving Bearings
Write For Prices

THE CANADA METAL CO., LIMITED
TORONTO WINNIPEG HAMILTON VANCOUVER MONTREAL



Perfect Wire Straightening Quickly and Profitably Done on Our
Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.
FORMERLY JOHN ADT & SON ESTABLISHED 1886
ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

Gear Cutting With the "IFS" Left Out

The Gear Shaper Way

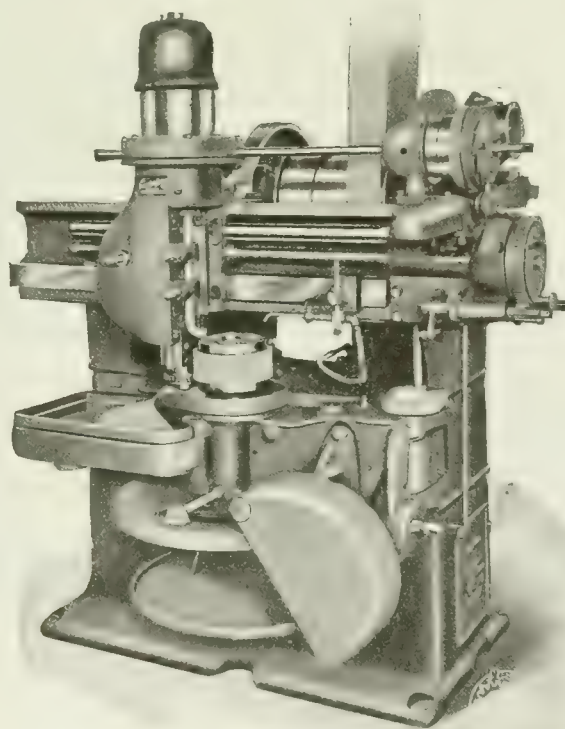
A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—
Gear Cutting with the "IFS" Left Out.

Send for your copy to-day.



The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

The Fellows Gear Shaper Company

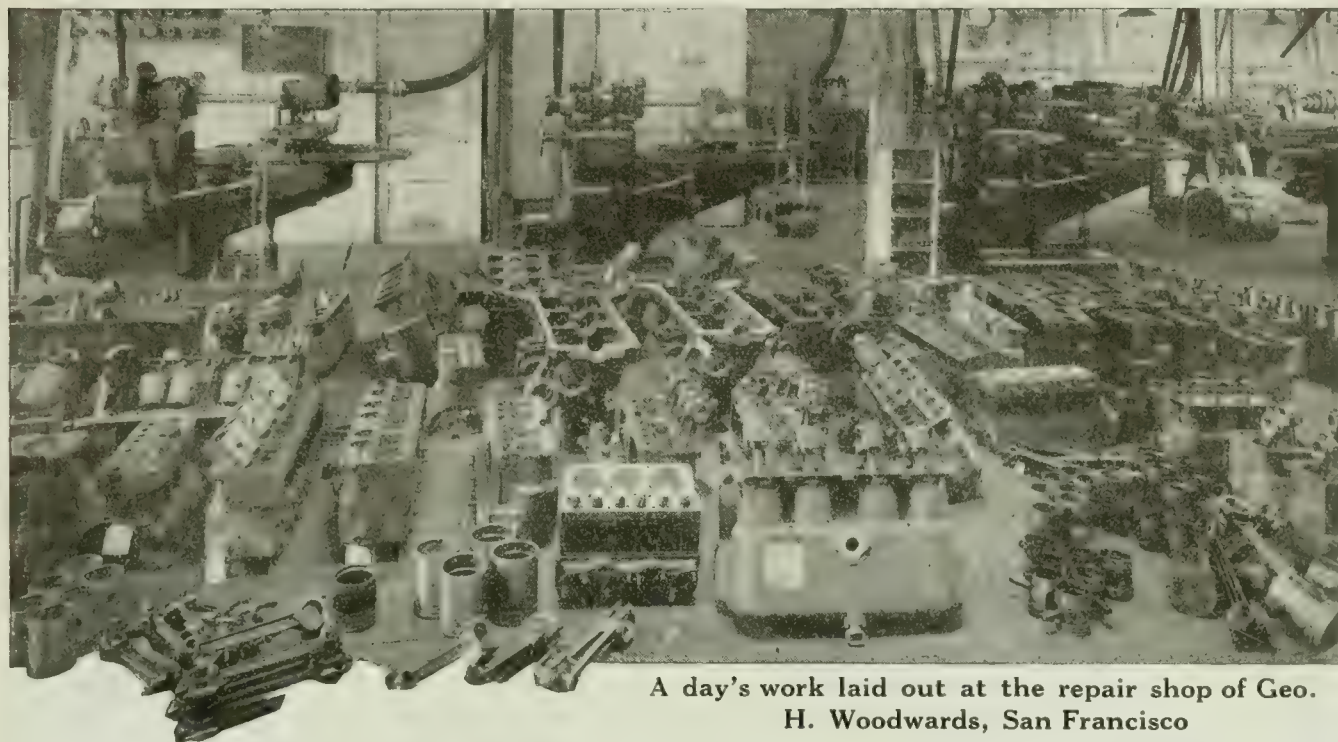
Springfield, Vermont, U.S.A.

FOREIGN AGENTS: Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Small Machine Shops, Auto Repair Shops Welding Companies

Do you want a business like this?



A day's work laid out at the repair shop of Geo. H. Woodward, San Francisco

Opportune Time

There is no business to-day that has the possibilities and which fits so nicely into a small machine shop, automobile repair shop, or a concern doing welding, as the regrinding of worn or scored cylinders.

Many companies would have had to close their doors this Spring but for the business obtained through regrinding. It does not require skilled mechanics for operators, and the profit received on the capital invested is unusually large.

The Field for Regrinding

There were over 9,000,000 commercial and pleasure cars registered during last year. Truck and tractor cylinders require attention once a year. Passenger cars should be looked over at least once every two or three years. Figure out for yourself what your chances are with only approximately 350 concerns properly equipped for such work.

Now is the logical time to get started. If you want figures, in addition to the above facts, write, wire or 'phone

The Heald Machine Company

51 New Bond Street

Worcester, Mass.

Branches at New York, Philadelphia, Buffalo, Cleveland, Detroit, Chicago, Cincinnati

Consider also the fact that three 4-cylinder blocks a day will bring profitable returns.

Advantages to the Automobile Owner

Reground cylinders fitted with new pistons and rings will give the motor as much, if not more, power and pep than when it was new. It cuts the oil and gas consumption in two and stops all excessive smoking.

Necessary Equipment

Eighty-four per cent. of all pleasure cars, and ninety-one per cent. of all commercial motors manufactured are ground, and Heald Machines are used exclusively. The Style No. 55 is built expressly for regrinding work. It is simple, moderately priced, self-contained, and has a very large capacity and range, easily taking care of singles, doubles, four and six en bloc cylinders.

In addition, to handle the work satisfactorily, one should have a small lathe and drill press, bench and hand tools. A small external grinder would be convenient for finishing pistons, thus enabling the shop to purchase semi-finished pistons and grind them to the oversize required.

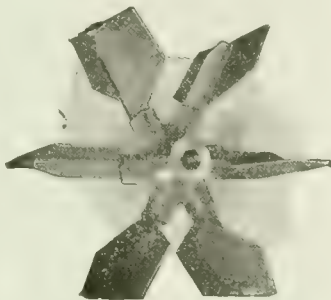
Canadian

The Canadian Standard Reversible Mill Exhauster will keep your shop clean, remove sawdust, shavings, fumes, gas or any loose materials and disagreeable odors.

Insurance rates can be reduced; floors and machines covered with sawdust, chips or shavings, increase the fire risk.

Insurance companies reduce the premiums where adequate precautions have been taken to prevent fires.

Blast Wheel — This wheel is so constructed that it will handle any kind of stringy material efficiently, such as sawdust, shavings, cotton lint. Will also handle gases, fumes, smoke, etc.



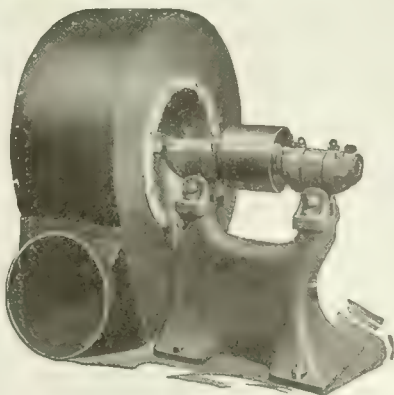
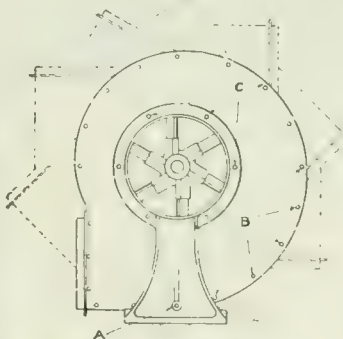
The Canadian Standard Planing Mill Exhausters have reversible housings so that the outlet can be adjusted instantly to any angle desired.

This eliminates necessity of crossed belts. Simplifies changes on alterations in piping or building.

The housing is of heavy rolled steel plate securely bolted together with angle irons. Round cast iron outlet bolted to the housing. Blast wheel mounted on heavy cast iron spider.

Every fan carefully tested by running test at speeds in excess of that required.

Write for Catalog 16.



Canadian Blower & Forge Co.

Kitchener - Ontario

VENUS PENCILS

The largest selling quality pencil in the world.

Engineers everywhere use the perfect VENUS knowing that none other gives the same supreme service and satisfaction.

With VENUS the fine, clean lines of working drawings are put in with ease and accuracy; the shadows and high lights of sketches take form with amazing results.

The exactness and uniformity of VENUS grading is your safeguard; it insures pencil efficiency and pencil comfort.

17 Black Degrees—3 Copying

For bold heavy lines	-	6B-5B-4B-3B
For writing & sketching	-	2B-B-HB-F-H
For clean fine lines	-	2H-3H-4H-5H-6H
For delicate thin lines	-	7H-8H-9H

Plain ends, per doz. \$1.50
Rubber ends, per doz., \$1.75

At stationers and stores throughout the world

American Lead Pencil Co.

238 Fifth Ave.
New York

Factory:
Hoboken, U.S.A.

Factory:
Sendon, Eng.



The world's most famous pencil

AMERICAN STEEL SPLIT PULLEYS

*Pulleys Should
Transmit Power,
Not Consume It*

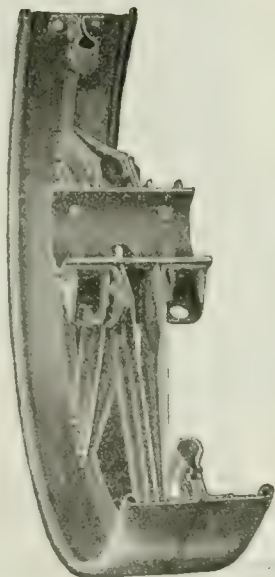
THE pulley that is strongest by test in actual operation—the pulley that is lightest—and at the same time has the minimum of belt slip is named "American."

There are between five and six million in constant use, proving these claims all the time.

Our book, "Getting Maximum Pulley Efficiency," tells how. Yours for the asking.

**The American Pulley Co.
Philadelphia, Pa.**

*Manufacturers of Steel Split
Transmission Pulleys, Steel
Sash Pulleys and Pressed
Steel Shapes*



A few of the large plants where American Steel Split Pulleys are helping to conserve power

International Harvester Co.
National Cash Register Co.
American Car and Foundry Co.
Procter and Gamble Co.
Ford Motor Co.
Cadillac Motor Car Co.
Packard Motor Car Co.
Studebaker Corp. of America
Dodge Brothers



Cut Costs

by using keen cutting files and keen cutting files only. When files cease to cut keenly discard them.

A dull file wastes money.

The following brands are made to cut keenly and are hardened to maintain their keen cutting edge:

**KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE**

Files and Rasps

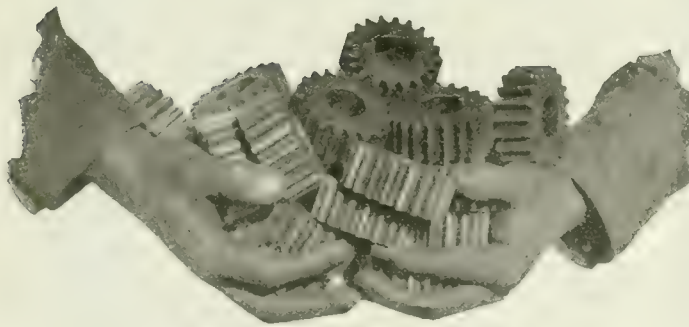
Made in Canada by
**Nicholson File
Company**

PORT HOPE, ONTARIO

If interested tear out this page and place with letters to be answered.



Cut Gears — Quantity Production



Write for Quotations
on any kind of
Gear Work

**Hamilton Gear
& Machine Co.**

Van Horne St. TORONTO

CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

Made in Canada

**L-XX HIGH-SPEED
ATLAS TOOL STEELS
ATLAS ALLOY STEELS**

Hot Rolled, Forged Blocks and Discs
Cold Drawn Steel and Drill Rod

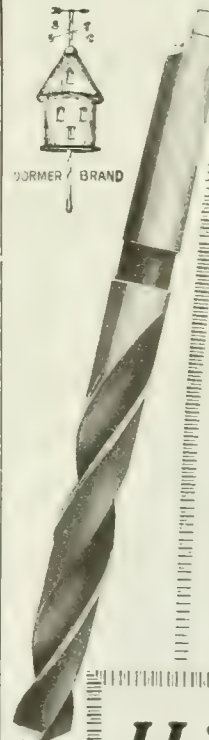
GENERAL SALES OFFICE:

133 Eastern Avenue, TORONTO, ONT.

Works: WELLAND, ONT.

Sales Offices and Warehouses:

TORONTO, ONT. MONTREAL, QUE. WINNIPEG, MAN.



Manufacturers:

**The Sheffield Twist
Drill & Steel Co., Ltd.**

Works: Summerfield Street, Sheffield.

To PROMOTE TRADE
within the EMPIRE,
CANADIAN MANUFACTURERS will find that
"DORMER BRAND
DRILLS" meet all require-
ments. QUALITY DRILLS
for quick drilling—USE
"DORMER."

Sheffield Engineering Supplies
Limited,

230 Craig Street West,
Montreal, Canada

**High Speed
Twist Drills**



DORMER BRAND

If what you need is not advertised, consult our Buyers' Directory and write advert answered.

STEEL CASTINGS

**QUICK
DELIVERIES**

**High Carbon Steel
Manganese Steel
Chrome Steel
Mild Steel**

**QUALITY
GUARANTEED**

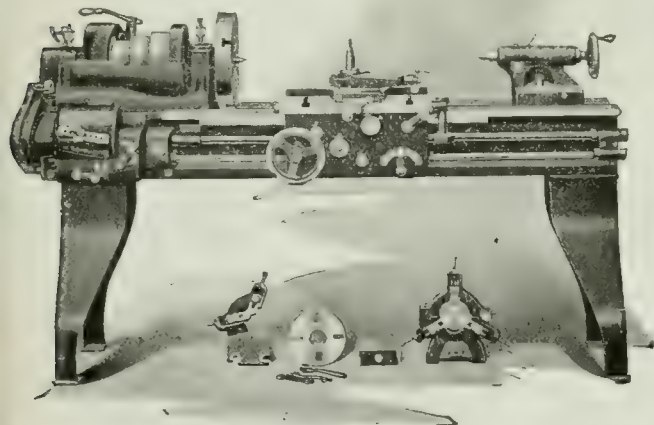
Sizes— $\frac{1}{2}$ lb. to 5,000 lbs. each

**THE WILLIAM KENNEDY & SONS,
LIMITED
OWEN SOUND, ONTARIO
ESTABLISHED 1860**

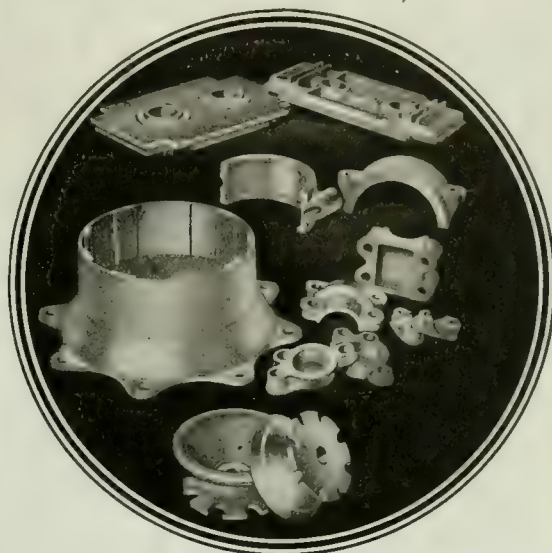
The ROCKFORD ECONOMY

This small, back geared, quick change engine lathe is a wonder for big production. Its extreme accuracy makes it particularly adapted to the tool room of the modern manufacturing plant. Made in 12", 14", 18", and 22" swing.

Write for full particulars of the small, heavy duty Rockford "Economy" without delay.



**Rockford Lathe and Drill Co.
Rockford, Illinois, U.S.A.**



Franklin Die-Castings for Aeroplane construction

Rapid Strides in Communication

Remember the old Pony Express? It averaged about eight miles an hour. Now fast mail coaches and mail-service aeroplanes travel *eighty* miles an hour.

This progress in communication has come about only within the last few decades. Franklin Die-Castings have aided this development by their use both in mail-coach equipment and in aero engines.

In 1892 we originated the Die-Casting Process. For nearly thirty years we have been reducing the cost and simplifying the output in many fields of industry. The addition of the standard No. 12 Aluminum to the Tin, Lead and Zinc base alloys already in use has enabled us to meet a still wider range of individual needs.

We quote from samples or blueprints. Write for booklet, "Franklin Die-Castings in Many Fields."

**FRANKLIN
DIE-CASTING CORPORATION
Gifford and Magnolia Sts., Syracuse, N.Y.**

FRANKLIN DIE-CASTINGS

BOLTS

SQUARE HEXAGON TEE-HEAD

Cut Them In Your Own Plant

*and Save Money on Cost and
Delay in Deliveries*

ACME BOLT CUTTERS

are made in various sizes for cutting bolts from $\frac{1}{4}$ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

May we send catalog

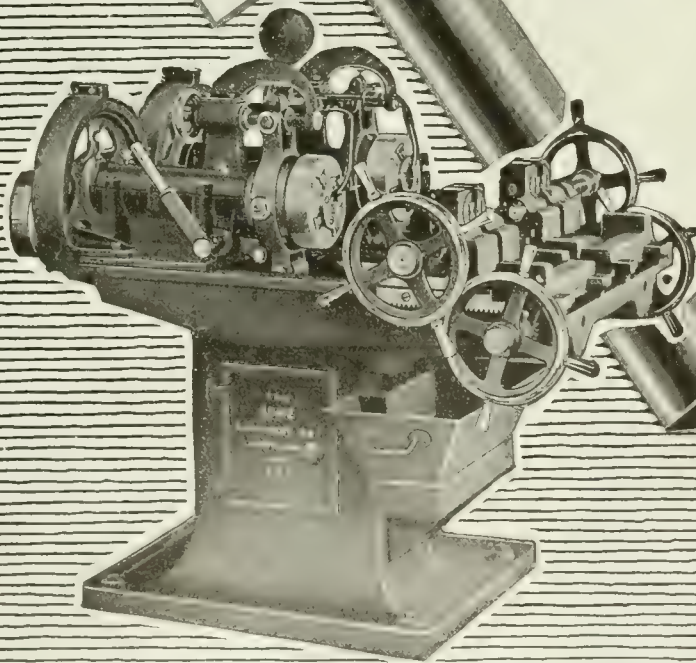
The Acme Machinery Co.

4530 St. Clair Ave. Cleveland, Ohio

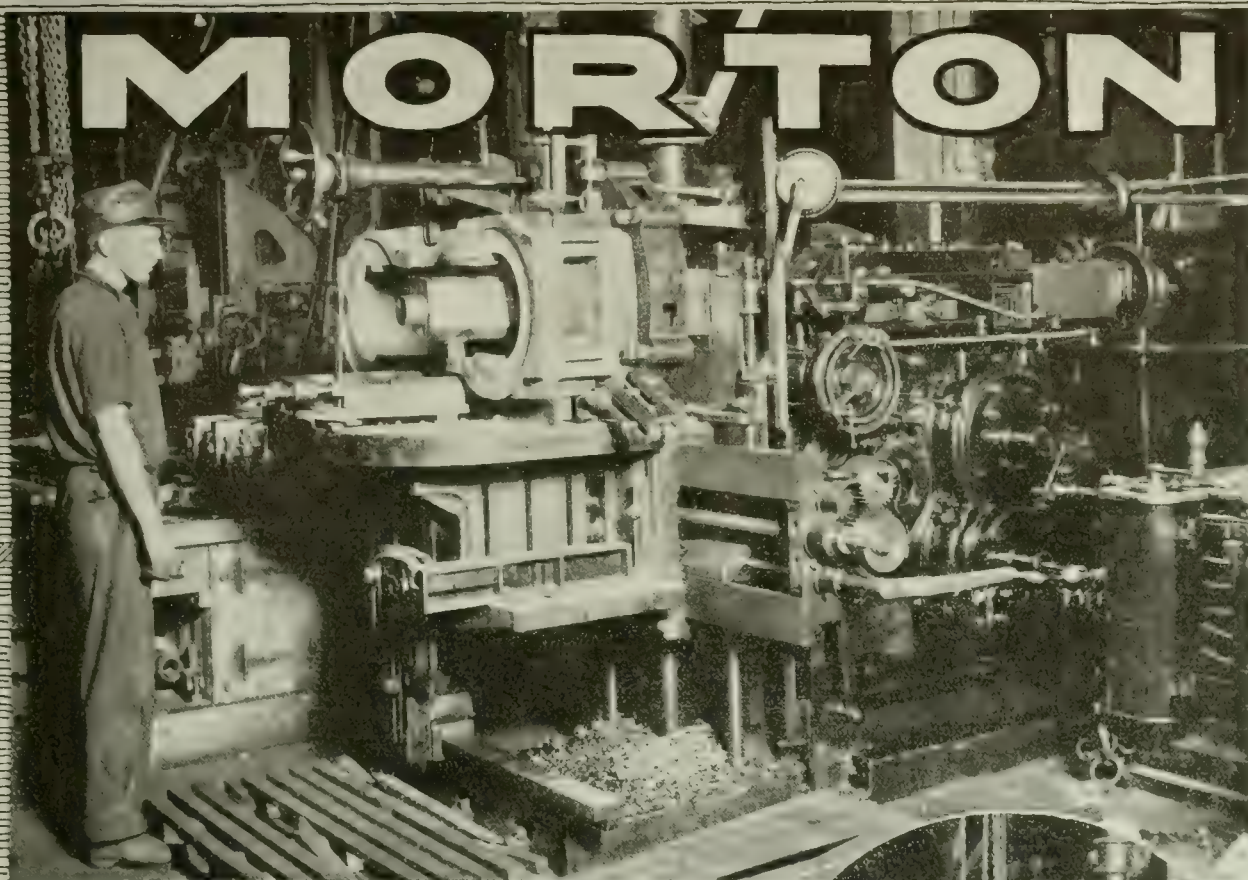
We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

Representatives for Canada:

The John Bertram & Sons Company,
Limited, Dundas, Ont.



ACME BOLT CUTTERS



Increased Driving Box Repairs Forced the Purchase of this Morton Draw Cut Shaper

Delays to output were traced direct to driving box repairs in this busy shop. Time element and shortage of man power were considered and the installation of this "Morton" reflects the good judgment of these thoughtful officials to install machines of guaranteed production power.

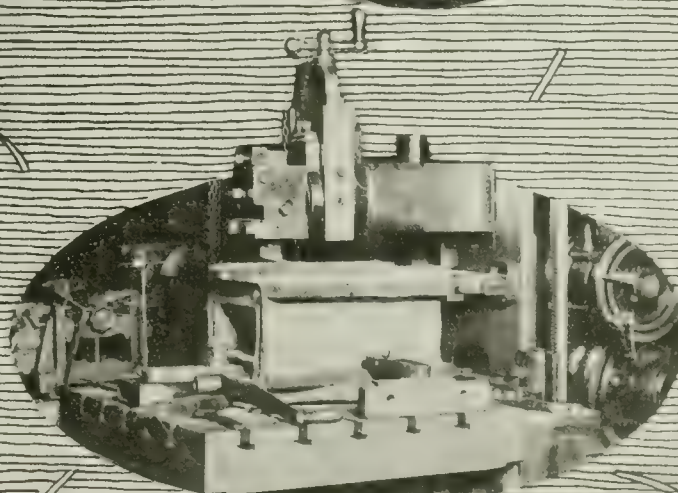
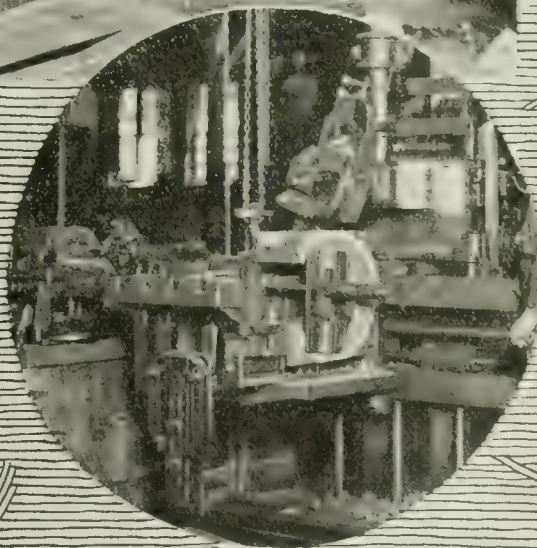
This Morton handles all the machine work on driving boxes—planing to thickness, planing shoe and wedge faces and crowning for bearing brass. It simplifies handling and reduces machine time.

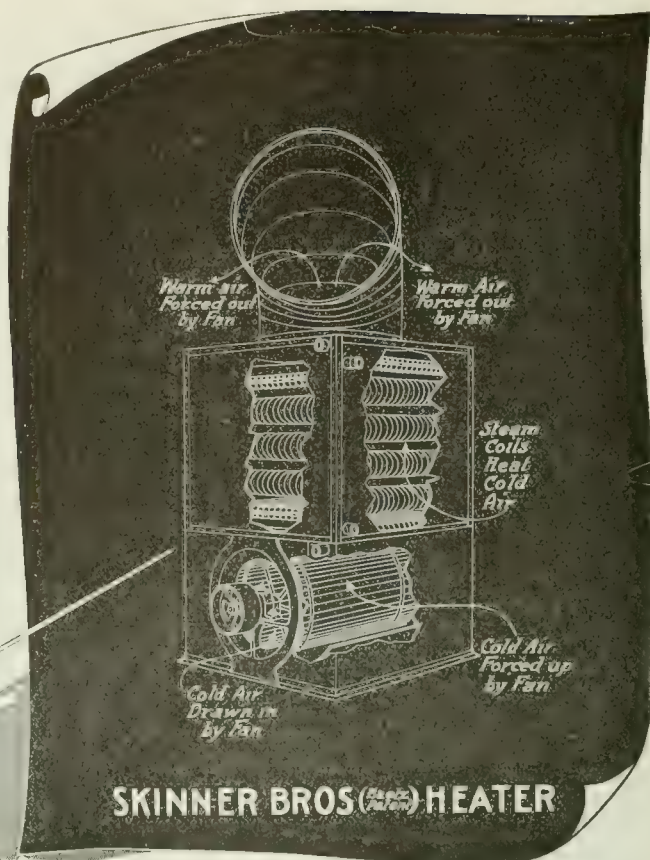
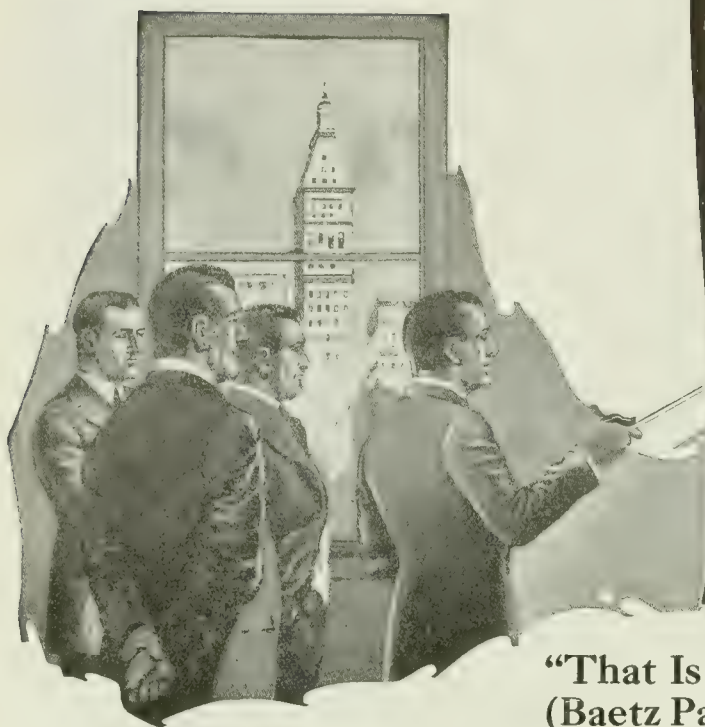
May we send Bulletin A-6 explaining numerous points of merit?

MORTON MFG. CO.

Muskegon Heights

Michigan





SKINNER BROS. (Baetz Patent) HEATER

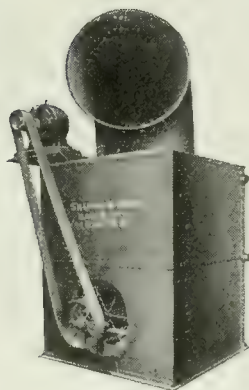
"That Is All There Is to the Skinner Bros. (Baetz Patent) Heater—No Pipes or Ducts"

"As you see, it consists of a series of steam coils compactly nested over a powerful fan-wheel, and enclosed in a sheet steel casing. Cold air at the floor level (or from outside) is drawn into the heater by the fan, and forced up through and around the steam coils—after it is thus warmed, it is gently diffused through the directing elbow out into the open building space."

Economical to Install and Operate

Skinner Bros. (Baetz Patent) Heaters are guaranteed to heat all of the open space in any large factory, foundry or plant interior. They cost 15% to 50% less to install than any other system—operating cost is equally low. They are strictly portable and require no special foundations. Use live or exhaust steam—where steam is not available, we furnish our direct-fired type DF, which burns coal, coke or wood.

Find out more about this wonderful heater—if you wish, we will send you names of users so you can investigate for yourself.



Steam coil type SC. Where steam is not available we supply type DF, burning coal, coke or wood. Fired like an ordinary furnace.

Skinner Bros. Mfg. Co., Inc.

1438 S. Vandeventer Ave.

St. Louis, Mo.

Boston.....449 Little Bldg.
Buffalo.....706 Morgan Bldg.
Cleveland.....616 Marshall Bldg.
Minneapolis...806 Metropolitan Life Bldg.

Chicago.....1508 Fisher Bldg.
Indianapolis.....330 Occidental Bldg.
New York.....1706 Flatiron Bldg.

Skinner Bros.

Baetz Patent HEATING SYSTEM

Skinner Bros. Mfg. Co., Inc.
1438 S. Vandeventer Avenue, St. Louis, Mo.
Please send complete details on Skinner Bros. (Baetz Patent) Heaters to
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We can use steam.

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A Cincinnati Grinder
That Gives "First Class Service"



"DALTON SIX"
Type B-4 Actual Swing 7 1/2 inches

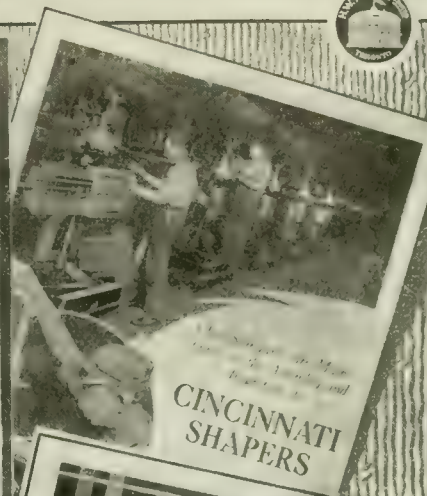
The Small Lathe
for the Big Job



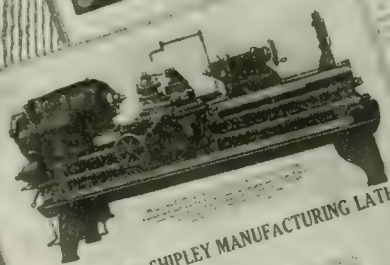
WHY order a
large Lathe
when so much of
your work could
be done on a
"DALTON SIX"
Type B-4

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SHAPERS

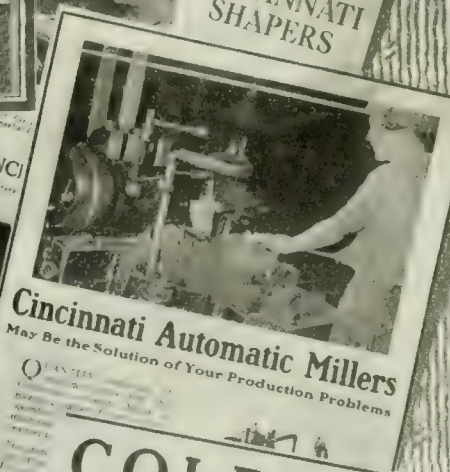


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CHICAGO, U.S.A.

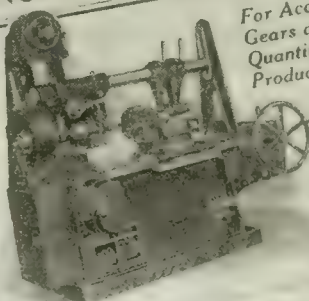
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to Satisfactory Service
is Found in the Use
of These Machine
Tools - Sold by
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MACHINE TOOL CO.



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May Be the Solution of Your Production Problems

CINCINNATI
16-INCH GEAR HOBBS



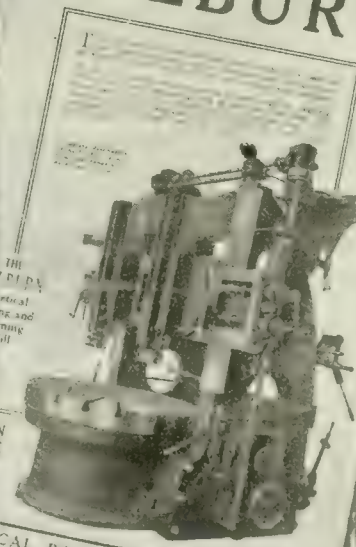
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Gears and
Quantity
Production



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Driver Upright Drilling Machine

The Cincinnati Backed Tool Co.
Tooling Company, Cincinnati, Ohio, U.S.A.


COLBURN



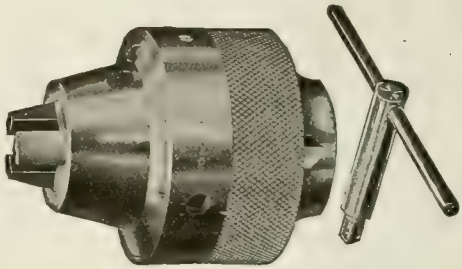
COLBURN BORING AND TURNING MILLS

The Cincinnati Gear Cutting Machine
CINCINNATI

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GIVE BETTER SERVICE



Skinner Drill Chucks eliminate most of the trouble of accurate drilling operations, simply because they are built right to hold the drill or tap accurately and rigidly on center. The hardened jaws are ground true. They are easy to handle, too, as there are no exposed gears to pinch the fingers.

The long life of Skinner Drill Chucks is due to the great care with which they are built. Made of the best materials available for the purpose. All working parts hardened to resist wear, and of sufficient strength to rigidly hold the tool to the work.

These Drill Chucks are all described in our catalogue, which will be sent to you with prices upon request.

THE SKINNER CHUCK COMPANY

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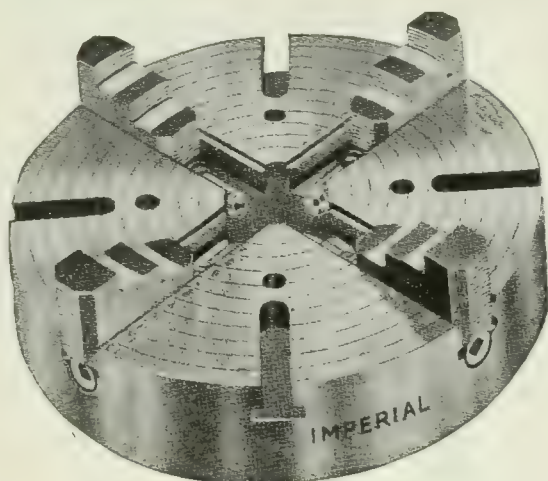
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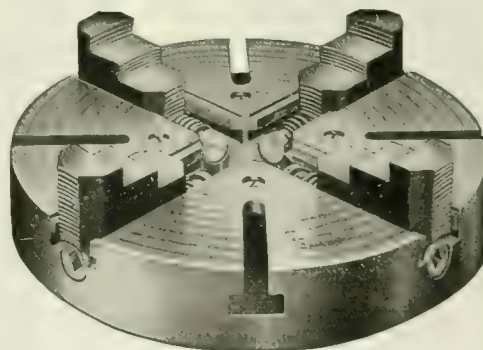
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are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

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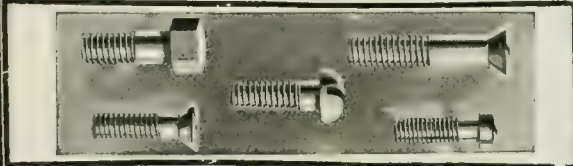
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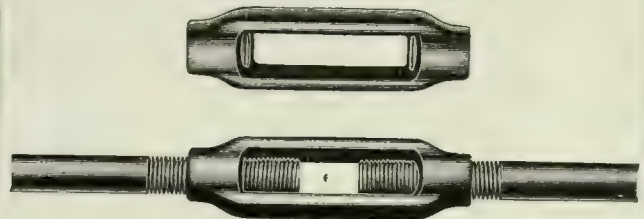
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EVERY man was his own shoemaker and tailor, the articles he made served his purpose after a fashion, but they would not be regarded as "efficient" to-day.

Many users of Industrial Furnaces are going back to the Stone Age when they undertake to build their own furnaces.

Is it not reasonable to suppose that Engineers who have devoted the best part of their lives to the science of designing and building of better furnaces should know more about it than you do?

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maintain large staffs of Engineers, have found it good practice to have us design and build their furnaces—such as Canadian Pacific Railway; Canadian National Railways; Steel Company of Canada, Ltd.; Canadian Tube & Iron Company, Ltd.; Crane Limited; Page Hersey Tubes Ltd.; Canada Grip Nut Co., Ltd.; B. J. Coghlin Co., Ltd.; Baldwins Canadian Steel Corporation, Ltd., etc., etc.

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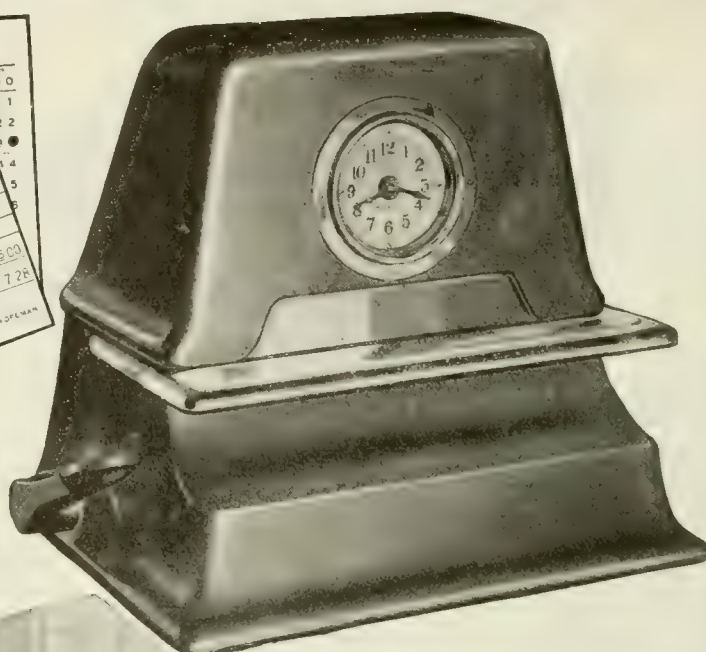
Frank Morgan APR 5, '20

PRODUCTION COST CARD
NAME H. Adams DEPT. Lathe
MACHINE NO. 269
PART NO. 2032
OPER NO. 1a

DAILY COST CARD
NO. 82 NAME Joe Purcell DEPT. Woodworking

TIME RECORD	DATE	RATE	COST	PIECES	ORDER NO.	OPERATION	
MAR 27	5 00	F	1.30	50	75	2124 Polishing	
MAR 27	3 24	N					
MAR 27	3 24	I	2.10	50	15.10	3206 Revolver	
MAR 27	1 10	S					
MAR 27	12 10	F	3.00	50	1.30	1.6	
MAR 27	9 05	F					
MAR 27	9 05	F	1.00	50	1.60	986 Face Chuck	
MAR 27	8 00	S					
TOTAL HOURS		8	RATE		56	MATERIALS 5.04 LABOR 4.40 TOTAL CHARGE 9.52	

MAR 26 5 00
MAR 26 7 28



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give you an accounting of the time spent by every employee on every job—an accurate record of all **Productive** and **Non-Productive** Time. They are employed in all lines of industry, supplying data which cannot be obtained accurately or economically in any other way.

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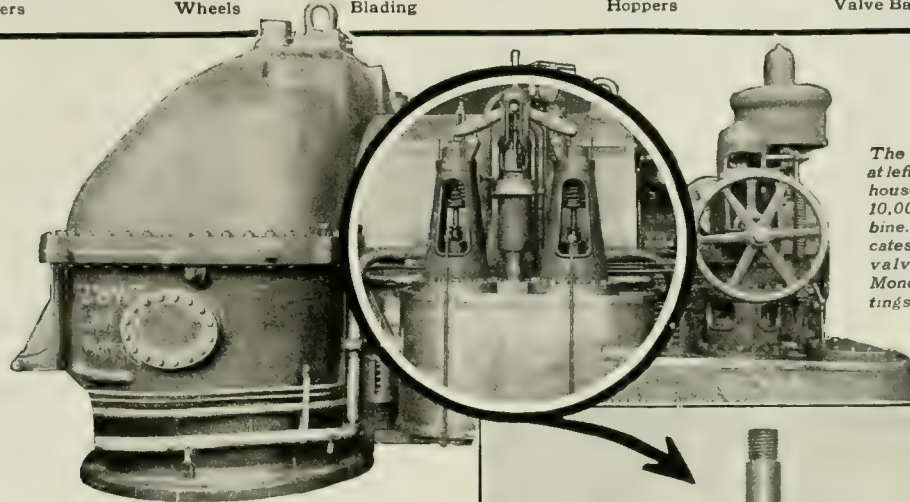
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For your convenience we have Service and Sales Offices in Vancouver, Winnipeg, Walkerville, London, Hamilton, Toronto, Ottawa, Montreal, Quebec, Halifax, St. John's, Nfld.

Also Manufacturers of International Dayton Scales and International Electric Tabulators and Sorters.

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Rings	Runners	Bushings	Ignition Chambers	Pivots	Blowers, Fans
Guide Stems	Valve Seats	Valves	Ignition Tubes	Diaphragms	Blading
Clappers	Trim	Valve Parts	Fuel Filters		Thermometers
Wedges	Hand Hole Covers	Spindles	Scavenger Valves	Conveying and	Bulbs
Spindles	Plunger Rods	Screws		Handling Apparatus	Special Apparatus
Dash Pots	Stuffing Boxes	Gear	Turbines	Chains	CO ₂ Recorders
Pistons	Plungers	Wheels	Poppet Valve Parts	Buckets	Watchman Recorders
			Blading	Hoppers	Watthour Recorders
					Valve Balls



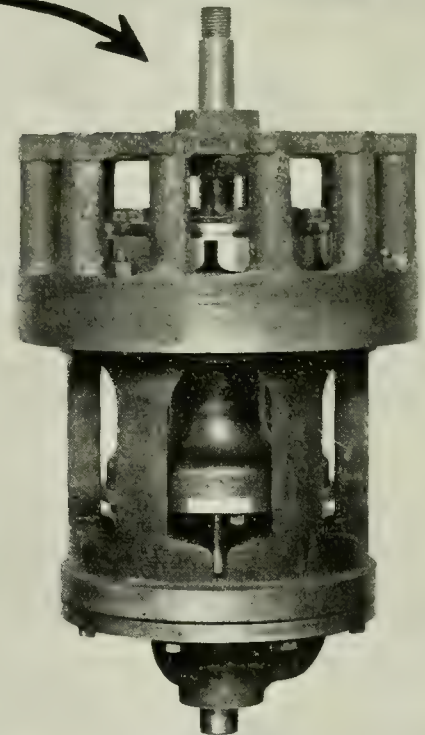
The illustration at left is Westinghouse 128 C.W. 10,000 K.W. turbine. Arrow indicates detail of valve in which Monel metal fittings are used.

Monel metal insures continuous machine service

WESTINGHOUSE uses Monel Metal in steam turbines as poppet valve parts and as blading because it resists corrosion and steam wear—withstands high heats—has the strength and approximately the co-efficient of expansion of steel.

These characteristics, plus the ability to resist most chemical attacks, make Monel Metal most valuable to engineers, managers and superintendents of manufacturing plants.

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The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

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Producers of METALLIC NICKEL in the forms of Ingot, Shot, Electrolytic Cathodes—99% Malleable Nickel, NICKEL SALTS, Oxides, Carbonates, Sulphates, Sulphides, Acetates, Formates—MONEL METAL, Ingot, Shot, Blocks

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The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

The Nationally Known—First Quality
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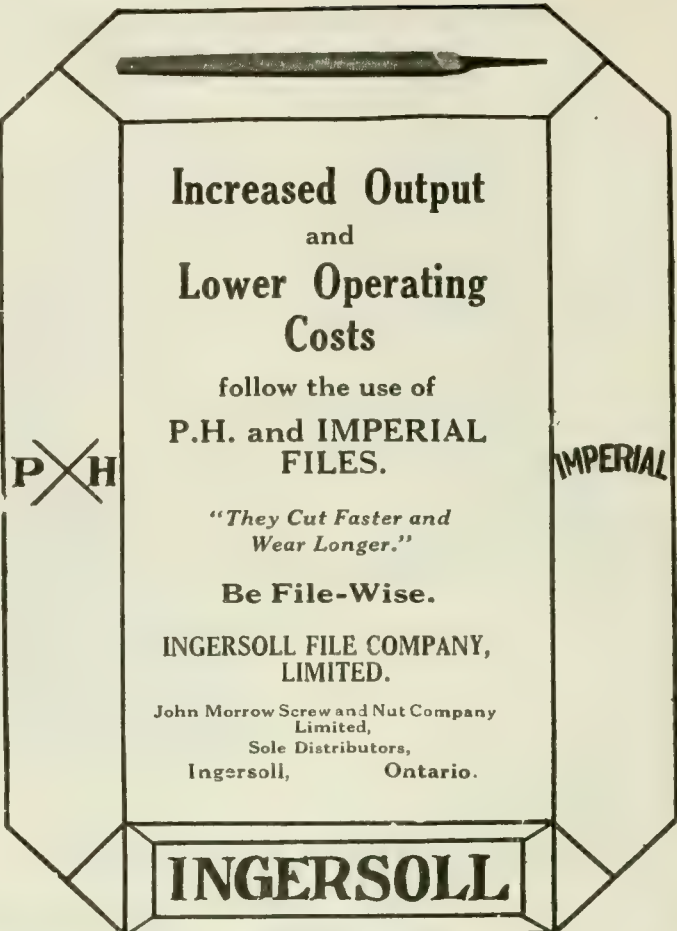
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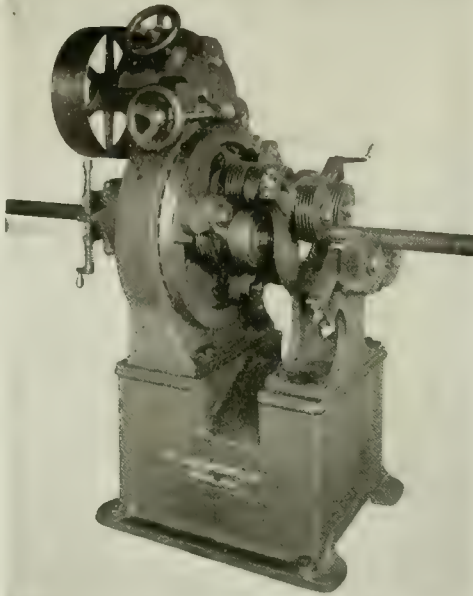
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Two
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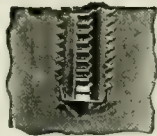
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injure the thread and waste half an hour of valuable production time. Instead—

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And save the casting.

Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

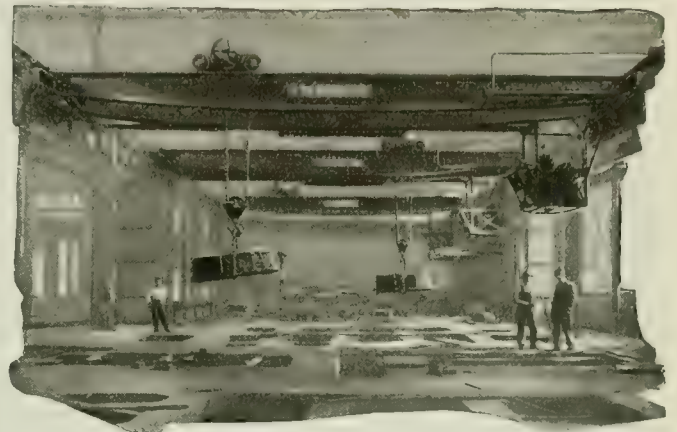
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The Walton Co.

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For faster foundry work

High speed production schedules are easily maintained in many foundries throughout the country by Shepard equipment.

Shepard Electric Traveling Cranes are rugged of design and built for everyday, year in, year out service — and deliver it. Operative parts, both electrical and mechanical, are contained within tight metal housings and are fully protected from dirt, dust, dampness, and fumes. Thorough lubrication is maintained by oil baths.

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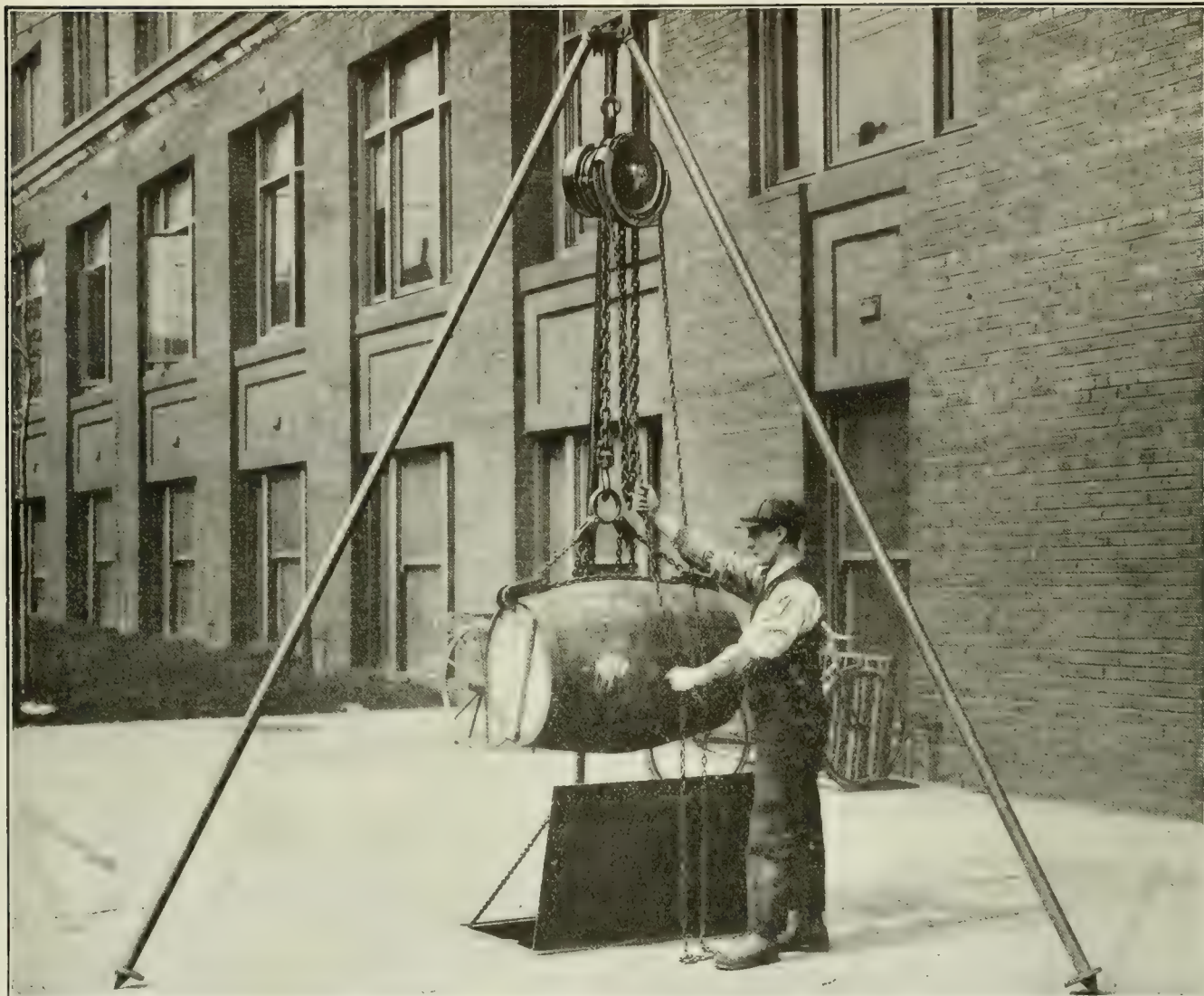
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Fitted with a Morris Triple Gear or Worm Gear Chain-block and used for setting machinery and making the occasional difficult lifts around your plant, will soon pay for itself and will occupy but little space when not in use.

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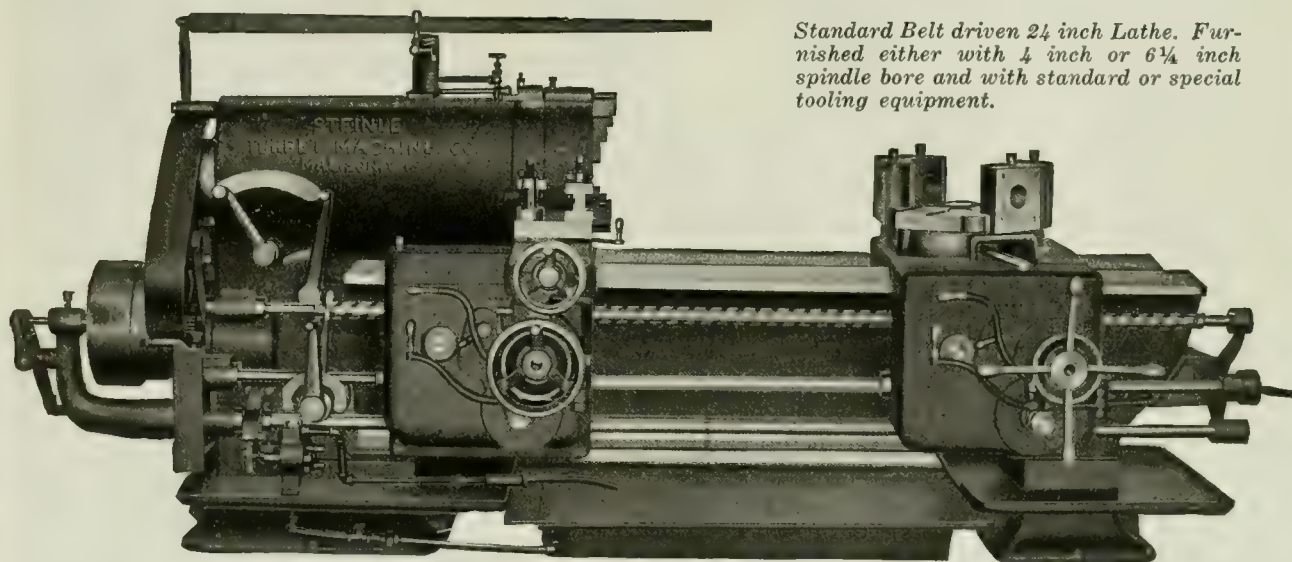
Specialists in the design, manufacture and application of lifting machinery and material handling equipment.

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Cranes and Chain Blocks

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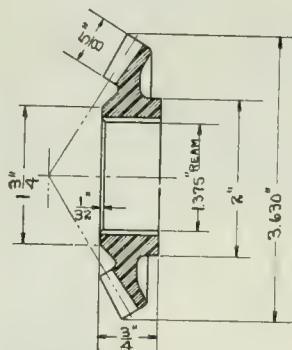
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Full Swing Side Carriage Turret Lathes



Standard Belt driven 24 inch Lathe. Furnished either with 4 inch or 6 1/4 inch spindle bore and with standard or special tooling equipment.

Bar Problems for STEINLE Solution



Material 3 1/2% Nickel Steel
Finish All Over
Time 12 Minutes

An Eastern gear and machine manufacturer operating a battery of STEINLES is now turning out from bar stock an order of 20,000 bevel gears as illustrated opposite.

In the first operation a 3 3/4 inch bar of 3 1/2 per cent. nickel steel is chucked so as to permit a production of five gears before rechucking. The gears are drilled, rough and finish bored, formed and cut off, then rechucked and the opposite side of the hub faced and turned.

Time twelve minutes complete, both operations included.

Send us drawings of your work so that our Engineering Department can estimate STEINLE production, or ask to have a qualified representative call upon you to determine what work can be produced to advantage on our machines.

Steinle Turret Machine Company

Originators of the Full Swing Side Carriage Turret Lathe

Madison, Wis., U.S.A.

AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Fran-

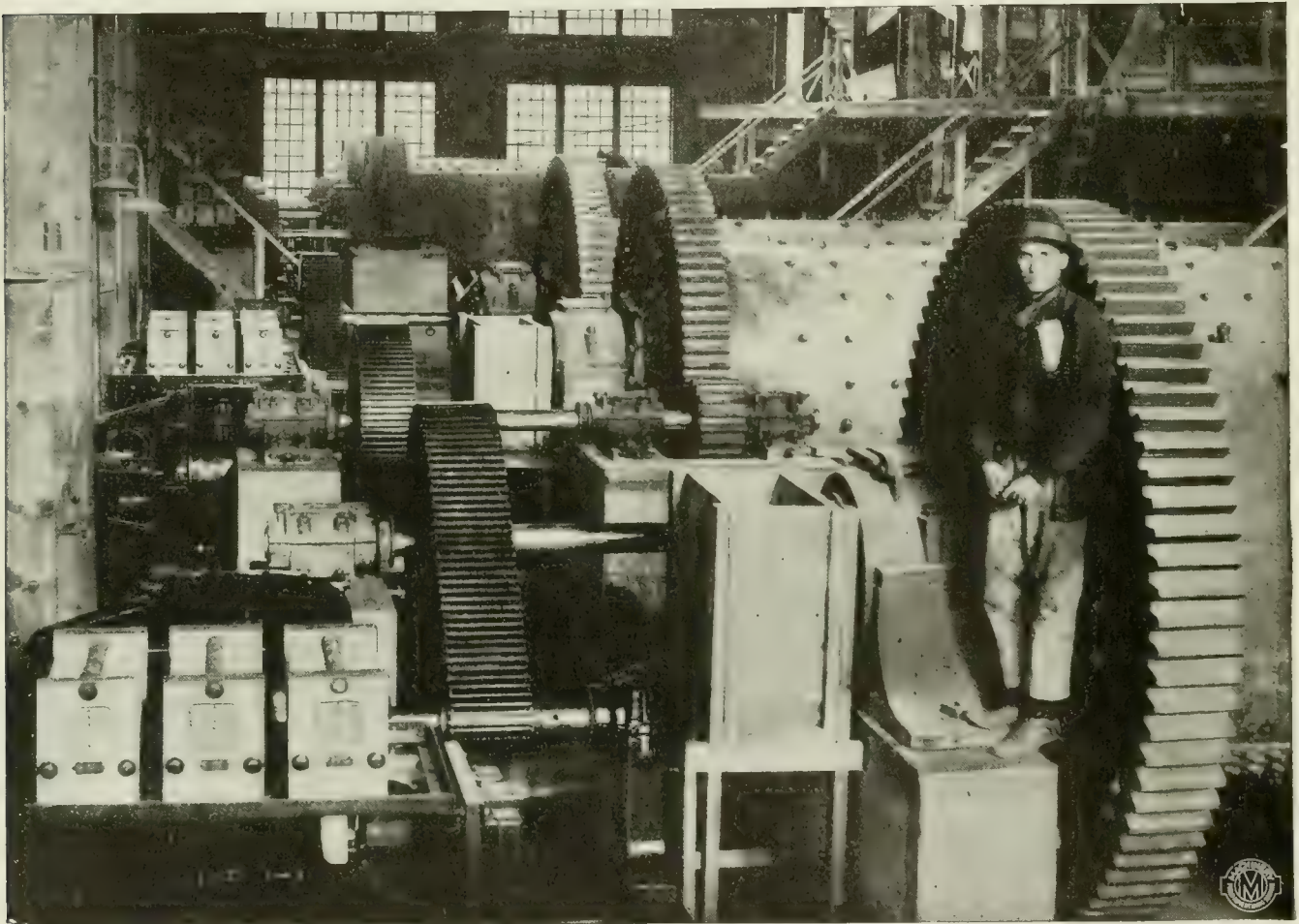
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Our Sales Engineers are Power Transmission Experts, who make it their business to secure results, that are the best available for your Power Problem.

Consult us on heavy, difficult or expensive drives.

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Morse Engineering Service

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ITHACA, N. Y.

Assistance Without Obligation

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"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

For Permanent Replacement

Replace the Old Roof permanently. When you reinvest in the old building do it with a permanent material that will not need constant painting and repairs—do it with a protected metal that will *not need replacement* in a few years—do it with Robertson Process Metal.

The fact that your old roofs need replacing in so short a time proves the need for a better material. It shows how unprofitable the unprotected metal has been—how its maintenance and upkeep costs have piled up and how in the long run the investment has not been profitable.

Comparative tests between unprotected metal and Robertson Process Metal are no longer necessary. The greater value in Robertson Process Metal has been demonstrated thousands of times—by actual usage. Hundreds of times it has out-lived unprotected metal by such a wide margin that roof costs over a period of years have been more than cut in half. Hundreds of times Robertson Process Metal has replaced old roofs and siding of all kinds and put an end to wasteful corrosion losses and repair costs.

This result is to be expected when you realize how the Robertson Process scientifically protects the metal and how each sheet is completely encased, with both surfaces and edges fully protected.

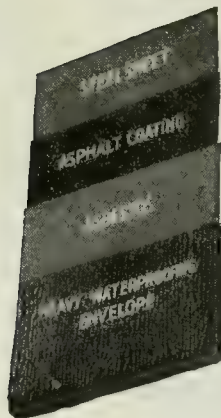
In the Banker's eyes the permanent substantial building represents an equally permanent and safe investment. The quick depreciation of ordinary steel sheets in comparison with long-lived protected metal is a point not to be overlooked by bankers, investors and business men generally. They invest in "building life" and because Robertson Process Metal has a *sure future* it has found its greatest opportunity for service *in new construction*.

Besides the savings in maintenance costs, in the cost of paint and repairs, the original cost of Robertson Process Metal is less than that of any other material of equal permanency. It makes possible the employment of lighter steel frame work and more economical foundations. By its speedy construction it effects still further savings.

You will find evidence of these facts in the experience of the users listed below. The purchasing agents, the factory superintendents, the officials of these companies do not buy with their eyes shut. They are scientific buyers of building materials. Their orders give assurance that Robertson Process Metal has earned its reputation by actual tests.

Let Robertson Engineers study your building and replacement needs. Estimates together with detailed information will be gladly furnished upon request.

The PRODUCT



Three impervious coatings (1) Asphalt (2) Asbestos (3) Waterproofing, stand between the metal and its many enemies. Each coat protects the other and together they perfectly shield the specially annealed steel within.

Refined Robertson asphalt forms an air-tight moisture casing first. To this protective coating a thick layer of asbestos felt is firmly bonded by powerful machinery. Because of the fibrous-rock character of asbestos it is indestructible. It cannot rot or decay. Acids and alkalis cannot affect it. The entire sheet is then enveloped and fully sealed by a thick weather-resisting coat. All metal parts of Robertson Skylights are made of R. P. M.

R. P. M. is made in corrugated, flat, beaded and mansard sheets for roofing and siding. It is also built into trim, flashing, gutters, downspouts and ventilators. Made in maroon and black.

The illustration opposite shows each step in the Robertson Process. A process sample will be gladly sent upon request—also practical literature.

The EVIDENCE

This partial list of users is significant because of the prominence of the various corporations and because *all of them have used Robertson Process Metal* after careful study or because of their experience with it on previous installations.

Abitibi Power & Paper Company, Ltd.
W. D. Beath & Son, Limited.
Brown Boggs Company, Ltd.
Canadian Electro Products.
Canada Furnace Company, Ltd.
Coke Oven Company of Canada, Ltd.
Dept. of Railways and Canals—Ottawa, Ont.
Dominion Glass Company, Ltd.
Dominion Iron & Steel Corporation, Ltd.
Dominion Sugar Company, Ltd.
Grasselli Chemical Company, Ltd.
Imperial Oil, Ltd.
Montreal Harbor Commissioners.
Moires, Ltd.
Montreal Locomotive Works, Ltd.
Nova Scotia Tramways & Power Company, Ltd.
Oneida Community Company Ltd.
Page Hersey Tubes, Ltd.
Sarnia Bridge Company, Ltd.
Department of Works, City of Toronto.

H. H. ROBERTSON COMPANY, Limited, Sarnia, Ontario

General Sales Office: Drummond Building, Montreal.

Branch Office: Kent Building, Toronto.

Agencies: Canadian Asbestos Company, Montreal and Toronto; Jamieson Engineering Company, Ltd., London Building, Vancouver; R. Y. Kilvert & Co., Builders Exchange Building, Winnipeg; Gandy & Allison, No. 3 North Wharf, St. John, N. B.; General Sales & Engineering Co., Metropole Building, Halifax, N. S.

ROBERTSON

PROCESS METAL

TRADE MARK REG. U.S. PAT. OFF.

FOR PERMANENT ROOFS, SIDING AND TRIM

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BABBITTS—METALS—SOLDERS

HOYT METAL COMPANY

MONTREAL

TORONTO

WINNIPEG

Heat Under Accurate Control

Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, is a feature that distinguishes

BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

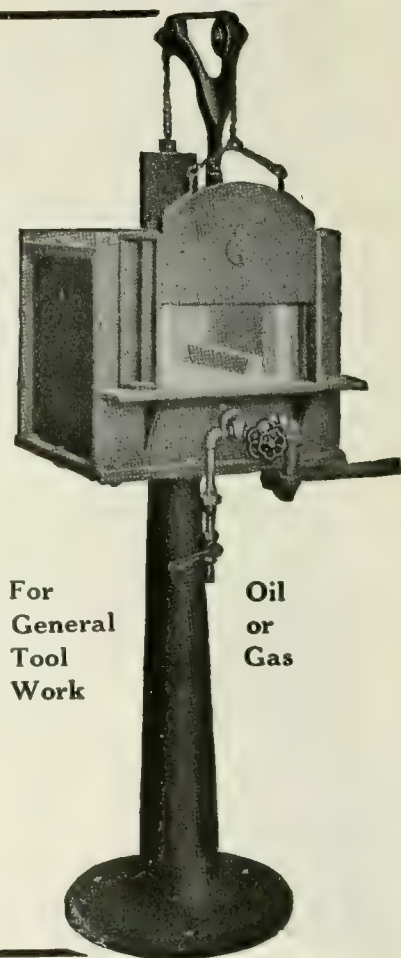
Let us advise you about your heat-treating problems

Bellevue Industrial Furnace Company

Julius C. Hinz, President

703 Bellevue Ave. - Detroit, Mich.

Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada



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Represented

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The next issue is dated May twelfth. It will be especially interesting to all. Send in your classified advertisements now.

CANADIAN MACHINERY, 143 University Ave.
TORONTO, CANADA

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

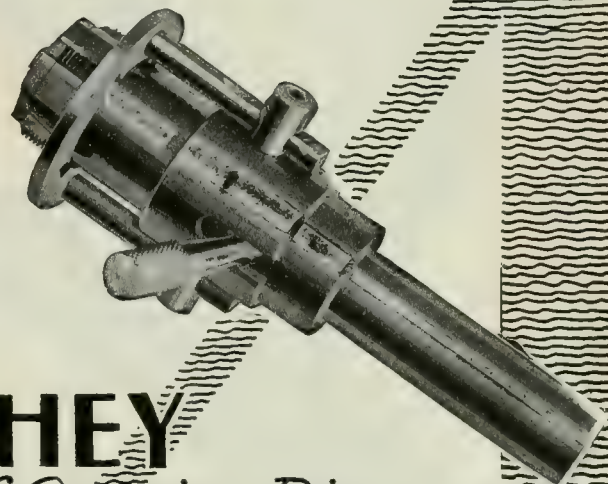
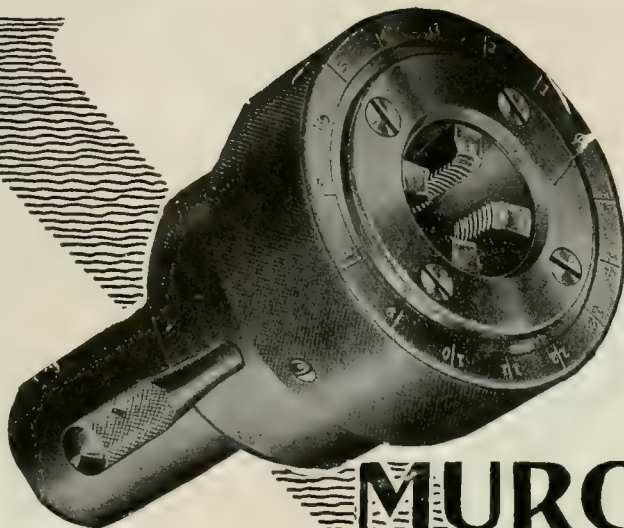
In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

EXPORTERS TO EUROPE

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited

PEMBROKE, ONT., CANADA



MURCHEY

Collapsing Taps & Self-Opening Dies

There are two all-important reasons why your Taps and Dies should be Murcheys. In the first place Murchey design cuts operating time in half and gives you better work. Secondly — you get prompt shipment on all Murchey Chasers.

Murchey Taps and Dies are built with long, hard service. The fine materials and workmanship used, their extremely simple design and rugged construction leave nothing to be wished for in the service they give their owners.

Send for a Murchey Tap and Die on Approval.

Murchey Machine & Tool Co., 75 Porter St., Detroit, Mich.

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THE MORSE CHAIN CO.

are the
Largest Manufacturers in the world
of
High Speed Silent Chains

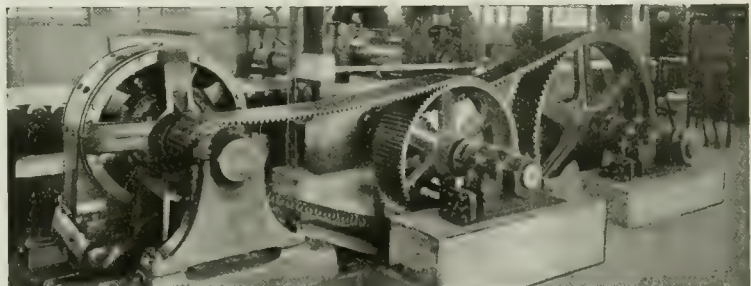
Why?

Morse Chain possesses the exclusive
Rocker Joint
Frictionless—Requires no Oilbath.

Jones & Glassco (Reg'd.)
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80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

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The New *Jacobs* *Super* Chuck



Jacobs

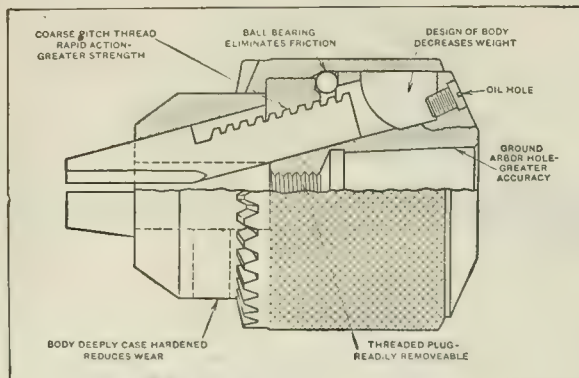
Announcement

The New Jacobs Super Chuck

Patented 1909-1915. Other Patents Pending

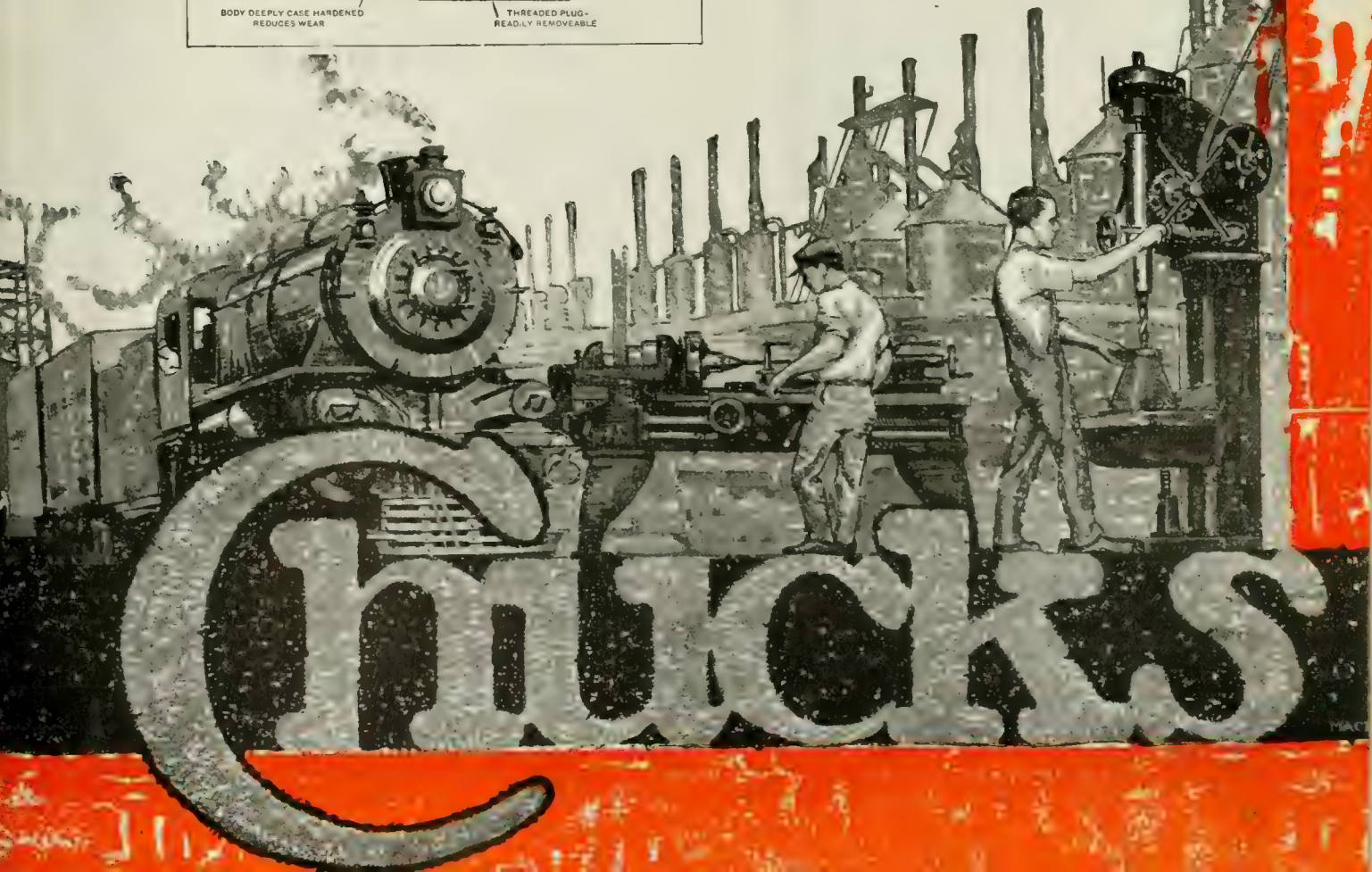
We present The New Jacobs Super Drill Chuck—our contribution to greater drilling efficiency—a better chuck even than the Jacobs Drill Chuck you have known and used for the past eighteen years. The New Super Chuck is fitted with ball bearings, is better proportioned, quicker in action, more durable—from all standpoints the best chuck experience has been able to produce, that money can buy.

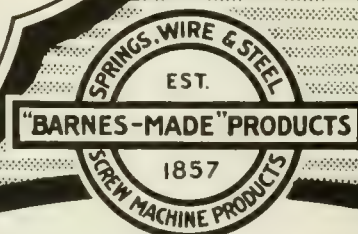
THE JACOBS MANUFACTURING COMPANY
Hartford, Connecticut, U. S. A.



*We predict great
things for this
Super Chuck.*

*You can expect
great things from
it.*





"Barnes-Made"

Flat Springs

All "Barnes-made" Products are made to customers' specifications. Small flat springs in endless variety have been supplied for every conceivable trade. This means an accumulation of engineering resources and manufacturing facilities allowing speedy and accurate quantity production of springs, stampings and washers. However exacting your requirements—they will be met. The success of your product is bound to be upheld by the "Barnes-made" product which goes into it.

Ask us to estimate

The Wallace Barnes Company

"Spring Makers for Three Generations"

Main Office and Works - Bristol, Conn.

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NEW YORK, U.S.A.

IMCO TOOLS

ushed to the Limit!

Every now and then your drilling, reaming and milling *must* be rushed to the limit. So, excessive power and strength is built into every "Imco"—thus every tool is prepared for those times.

**Catalog of 3 and 4-lip drills,
reamers and milling cutters
upon request.**

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Ingersoll Machine & Tool Co., Ltd.

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Toronto Office — 80 Bay St. Phone Adelaide 7227.

Chas. A. Strelinger Co. Ltd. Windsor, Ont.

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The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

This Bank has 730 Branches, of which 626 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.

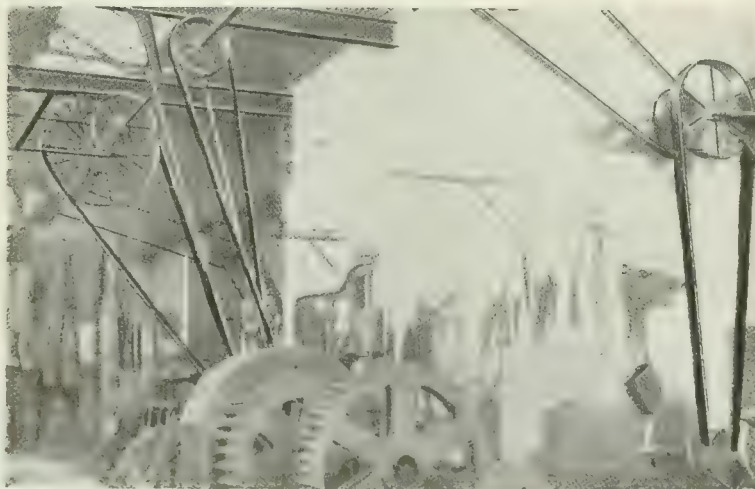
THE ROYAL BANK OF CANADA

Capital and Reserves \$40,000,000

Total Resources \$544,000,000

Head Office: MONTREAL

Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

Solid Woven Cotton Hair Twintex

These beltings will solve your driving problems and save you money.

SUMNER & CO.

108 WORTH ST.
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702 Southam Bldg., Montreal

You Gain in Length of Service

HEPBURN

POWER PRESSES

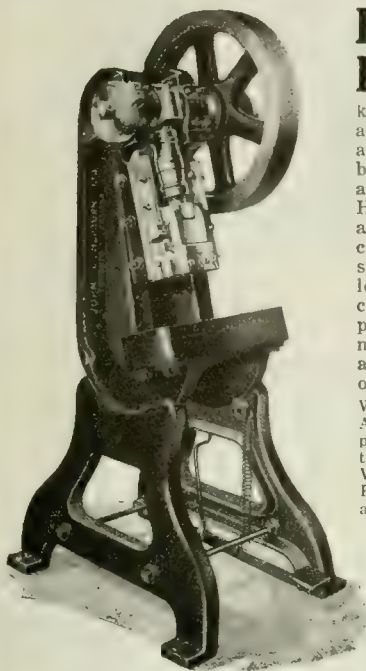
keep on turning out accurate work long after an ordinary press has to be scrapped. Why? The answer is simple. Every Hepburn Press is strong and well built. The cranks are made from solid forgings and give long strokes. The entire construction is so proportioned that weaknesses never occur. Quick adjustability a feature of every press.

Write for specifications. Also we will gladly give particulars about our Vertical Engines, Compressors, Winches, Derricks, Steam Pumps, Blacksmith Work and Acetylene Welding.

JOHN T. HEPBURN Limited

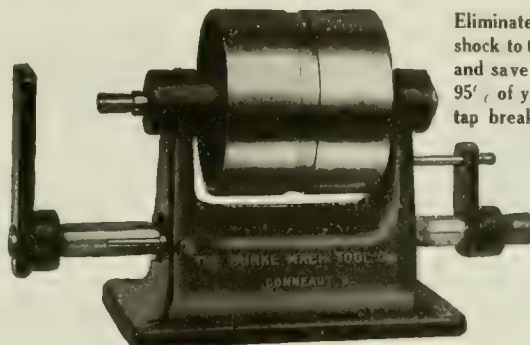
Engineers and Iron Founders

18-60 VAN HORNE STREET, TORONTO, ONTARIO



It pays to use high-grade machine tools

THE BURKE FRICTION DRIVEN TAPPING MACHINES



Eliminate all shock to the tap and save 95% of your tap breakage.

In addition to this, you are assured of producing the maximum amount of well-tapped holes with inexperienced labor. Machines are also used for lapping, burring, reaming, countersinking, assembling and similar operations. Built in three sizes, 3-16" at \$25; 3/8" at \$45, and 1/2" at \$60, Canadian money.

Let us send descriptive circular, or send your samples or blue prints and ask for production estimates.

THE BURKE MACHINE TOOL CO.

520 Sandusky St., Conneaut, Ohio, U.S.A.

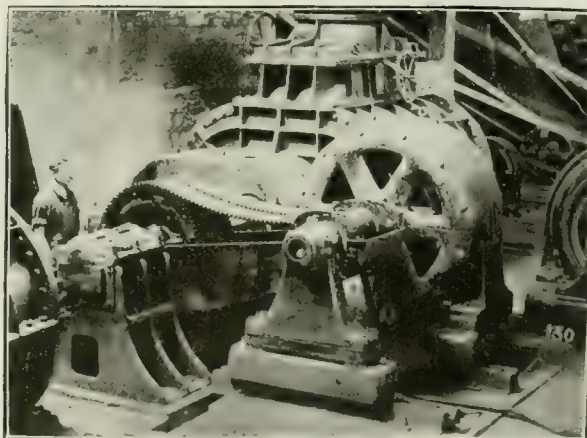
Canadian Dealers:—H. W. Petrie Ltd., National Machinery & Supply Co., A. R. Williams Machinery and Supply Co., Canadian Fairbanks-Morse Co., Williams & Wilson, Garlock-Walker Machinery Co., Yeates Machinery Co., Cope & Sons, Geo. F. Foss Machinery & Supply Co.

RENOLD DRIVING CHAINS

(THE CHAINS OF UNIVERSAL REPUTE)

ONE
QUALITY ONLY—
THE BEST

OUR POLICY SINCE
1879



RELIABLE, COMPACT,
EFFICIENT and DURABLE

Note particularly compact features of 350 H.P. Renold Silent Chain Drive to Roots Pressure Blower.

If YOU are interested in increasing YOUR Production, also improving the Quality of YOUR Product, YOU MUST consider

RENOLD DRIVING CHAINS FOR POWER TRANSMISSION

WRITE FOR BOOKLET NO. 200 5—"NOTES ON SELECTION OF CHAIN GEAR."

HANS RENOLD OF CANADA, LIMITED

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MONTREAL

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TORONTO

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Dominion Oxygen

A Canadian Product at the Disposal of Canadians

DOMINION Oxygen of the highest and most uniform purity is now being supplied to users throughout Canada from five perfectly equipped distributing stations. At Toronto, Hamilton, Montreal, Welland and Windsor are efficiently organized forces whose business it is to insure prompt delivery of your oxygen requirements.

Wherever your location, whatever quantity of Dominion Oxygen you may need—your order will be filled on the day it is received. It is through such service that the Dominion Oxygen Company Limited has secured the generous patronage of Canadians, which it hopes to continue to merit.

DOMINION OXYGEN COMPANY, LIMITED
Hillcrest Park, Toronto
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OXYGEN AND HYDROGEN (ELECTROLYTIC)

National Electro Products Limited is the largest manufacturer of Electrolytic (pure) Oxygen and Hydrogen in Canada.

WE PRODUCE GASES EXCLUSIVELY BY ELECTROLYTIC DECOMPOSITION OF WATER

We are, therefore, in a position to furnish Oxygen and Hydrogen far superior to like gases made by any other process.

After Exhaustive Tests We Have Decided to Handle the Well-Known

The Torch for Welders

PUROX
OXYGEN
HYDROGEN

Who Want the Best!

WELDING AND CUTTING TORCHES

Our entire organization—technical and sales—is always at your service.

NATIONAL ELECTRO PRODUCTS LIMITED

HEAD OFFICE: 87 CHURCH STREET, TORONTO

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87 Church Street
Main 881 and 1626

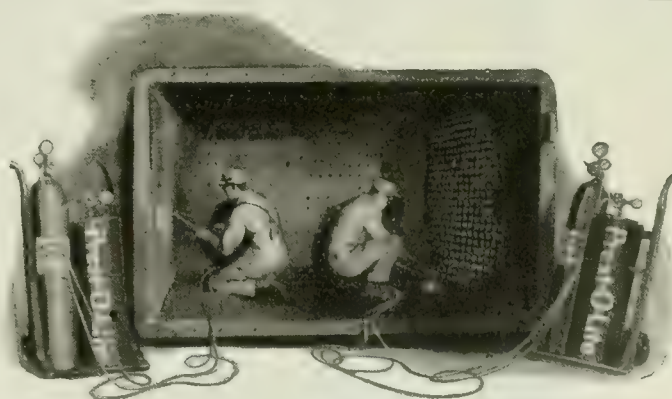
MONTREAL SALES OFFICE AND FACTORY

149 Moreau Street
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TORONTO FACTORY

295 Dufferin Street
Park 7656

Baptizing a fire- box with flame



One reason why the oxy-acetylene process is to-day so widely used in shops and yards for scientific reclamation and manufacture is that

Prest-O-Lite

DISSOLVED ACETYLENE

in readily portable cylinders permits the use of the process both under roof or in road maintenance to the best possible advantage.

A chain of centrally located plants and warehouses makes possible a constant and plentiful supply of this exceptionally good welding and cutting gas.

PREST-O-LITE COMPANY OF CANADA, LIMITED
HILLCREST PARK, TORONTO

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Plants at: TORONTO, ONT.
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SHAWINIGAN FALLS, P.Q.

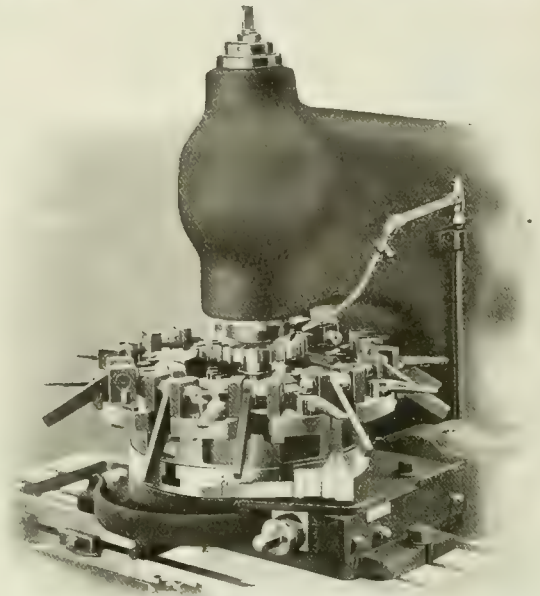
PWC-543

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MILWAUKEE MILLING MACHINES

KEARNEY & TRECKER
MILWAUKEE
MILLING
MACHINES

Continuous milling of 10-inch adjustable wrenches on a Milwaukee Vertical Milling Machine. These parts are turned out at the rate of 3,000 a day and the finished surface bears a constant and accurate relation to other selected points on the part.

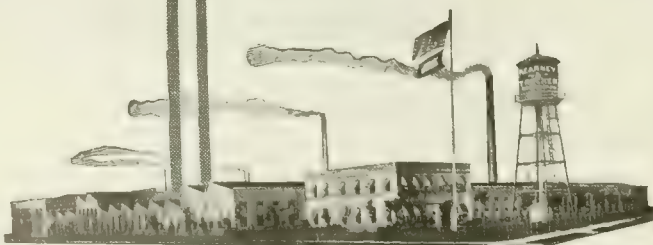


Rapid, Economical Milling

Manufacturing milling by the continuous process is an advanced step in milling machine practice that is worthy of the serious consideration of the management of any plant. The motion in this milling process is continuous. It is reasonable, therefore, that in this way maximum production is secured. This sort of milling is most desirable in the machining of parts in large quantities. The rotary table with chucking fixture holding the work revolves, and the cutter is in operation and in the work at all times. The operator removes the finished piece and puts another unmilled one in its place.

Milwaukee Vertical Milling Machines are particularly well adapted to continuous milling. The spindle is adjustable for wear only as sufficient adjustment can be obtained by the adjustment of the knee alone, the same as it is in the horizontal type milling machines.

Have you any milling that would be well adapted to continuous milling? Let us help you.



KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

Canadian Representatives:

Williams & Wilson, Ltd., Montreal
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24-inch Universal Shapers

Into the design and construction of Universal Shapers have gone the united knowledge and best efforts of a staff of specialists in the tool, jig and machine tool field.

Consider these features—

It planes parallel in the heaviest cuts.

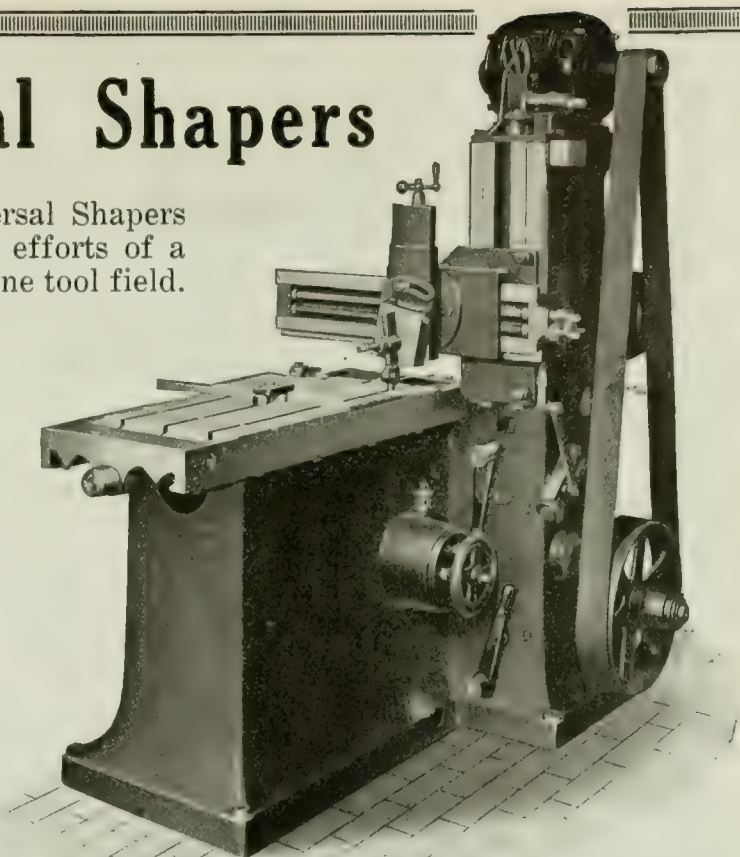
It planes accurately—horizontally as well as vertically.

It handles efficiently a wide range of shaper and planer jobs—particularly those considered awkward by **both** these machines.

Operator can reach all adjustments from working position.

Have you full particulars?

**Universal Machine & Tool
Company**
Canton, Ohio, U.S.A.



ACCURACY

McDOUGALL SHAPERS

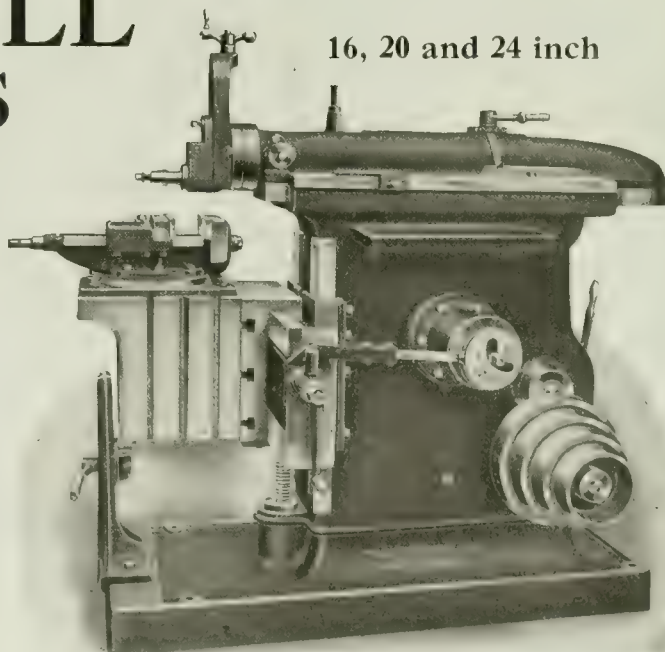
*Modern Tools
for Modern Plants*

THE quality and quantity of Canadian production depend largely upon the kind of tools used.

McDougall Shapers are the right tools for bigger accomplishments. Characterized by simple, clean-cut design and inflexible rigidity they produce **fast** and accurate work.

We will be glad to send complete specifications and descriptions.

16, 20 and 24 inch



The R. McDougall Company Limited, Galt, Ont.

Sales Agents: The Canadian Fairbanks-Morse Company, Limited

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\$500 IN CASH FOR THE BEST STORIES

On the Subject:

***"To What Extent Does Cleaning
Influence Production and Quality"***

Contest opens April 15—closes July 1, 1921

OPEN TO ALL

YOU can win a prize. Write a story based on facts in your plant. How work is cleaned, the methods used and what bearing they have on production and quality.

The subject offers everyone, in all industries, a splendid opportunity to tell about and analyze production methods and all the elements in connection therewith, as they may relate to cleaning. These stories should be particularly valuable at the present time because ideas and suggestions which may lead to a lowering of manufacturing costs and more balanced production will be welcomed by all manufacturers in all industries.

The contest is designed to bring out additional and useful ideas on every phase of cleaning and the manner and extent to which cleaning influences quality and quantity of output.

PRIZES

\$100—best story
\$75—second best
\$50—third best
\$25—fourth best
\$10—each next
25 stories

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OAKLEY CHEMICAL CO.
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ALLIGATOR

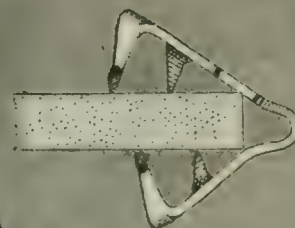
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STEEL BELT LACING

Best for Every
Type of Belting

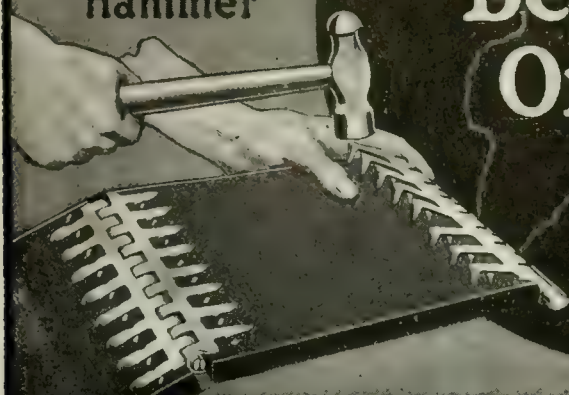
Nothing
Needed But a
Hammer

The
Strongest
Belt Lacing
On Earth



Double Staggered
Teeth Insures
Strong
and Firm Grip

"Never
Lets Go"



Reg. U.S. Pat. Office

Jobbers—Dealers

Sell Satisfaction and Economy When They Sell ALLIGATOR Steel Belt Lacing

Go over these features that make "ALLIGATOR" the best belt lacing proposition for you and for your trade.

FLEXCO-LOK

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Steel Lamp Guards



Protects lamps
from breakage
and theft—prop-
erty from fire.
An efficient, in-
expensive secur-
ity against dan-
ger, losses and
delays.

Made in all
styles and sizes
with reflectors
and handles if
desired. Patent
lock prevents
theft. Sold at a
distinct economy

to the purchaser. Write on letterhead
for information, prices, etc. Not in
stock in London.

First: National and local advertising in carefully selected general publications, trade papers and consumer class publications interests all belt users and creates a demand that has been growing for twelve years.

Second: ALLIGATOR is preferred by Master Mechanics in every industry all over the world for its ease and facility of application, long life in operation, belt saving characteristics and economical features. The decision of hundreds of thousands of belting users should influence you to stock it.

Here are other reasons:

ALLIGATOR is the most easily and quickly applied of all belt lacings. **Only a hammer needed and three minutes average time to lace a belt.** Anyone can put it on.

Besides this important feature, this belt lacing has proven the strongest and consequent-ly the most efficient in every test.

It outlasts any other type of belt lacing—and **saves the belting.** See illustration and note how the staggered teeth penetrate without injuring the belt and clinch down flat. Also note the sectional steel rocker hinge pin which makes a flexible hinge joint that hugs the pulley, is no thicker than the belt, and permits belt to be run on both surfaces.

In addition the use of ALLIGATOR Steel Belt Lacing is the most economical manner of taking up stretch on new belts and of relacing and repairing old ones. Only one end of belt need be cut off in shortening; or to lengthen, insert stub of correct length.

Can be kept handy in stockroom or tool box for immediate service thus avoiding any possible delays. Represents big saving and convenience to your customers on any kind of belting. A complete service for all thicknesses of power or conveyor belting. A size and type for every need. Write on letter head for samples and trade prices.

FLEXIBLE STEEL LACING CO.

4610 Lexington St., Chicago, U.S.A — Stocked by the Best Supply Houses in Canada — 135 Finsbury Pavement, E.C., London

A Product That Deserves Your Consideration

Mo-lyb-den-um Steel

—for it is a steel which undoubtedly will be widely used in manufacture where other steels *not altogether* satisfactory are now being used. Tests toward this end are being made, and results so far indicate a surprising advantage in the use of this new Alloy Steel for numerous purposes.

Molybdenum Steel seems to be applicable to a greater variety of uses than any other Alloy Steel known, and it possesses exceptional working qualities. It is readily forged and machined, and permits application of an unusually wide temperature range in heat treating.

Manufacturers in many lines are now actively investigating Molybdenum Steel for their products.

Our own Metallurgists and Engineers are also deeply interested in Molybdenum Steel and its possibilities. They are prepared to co-operate with you in adapting this steel to your needs.

Molybdenum Steel—as well as all of our other analyses—we can furnish in all types and in electric and open hearth furnace grades. Our company has made a greater tonnage of Molybdenum Steel than has any other steel manufacturer, and ours was the first company to produce it in commercial quantities.

UNITED ALLOY STEEL CORPORATION CANTON, OHIO

DETROIT
SYRACUSE
CLEVELAND

NEW YORK
INDIANAPOLIS
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PORTLAND
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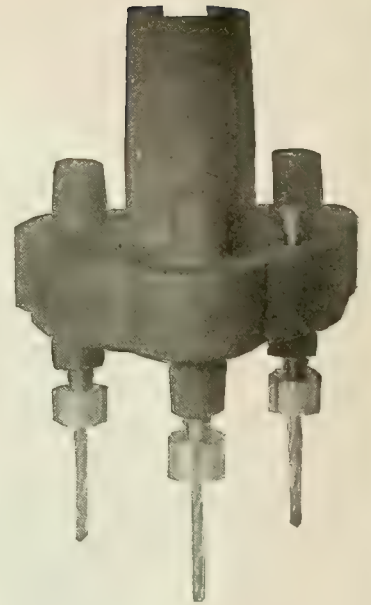
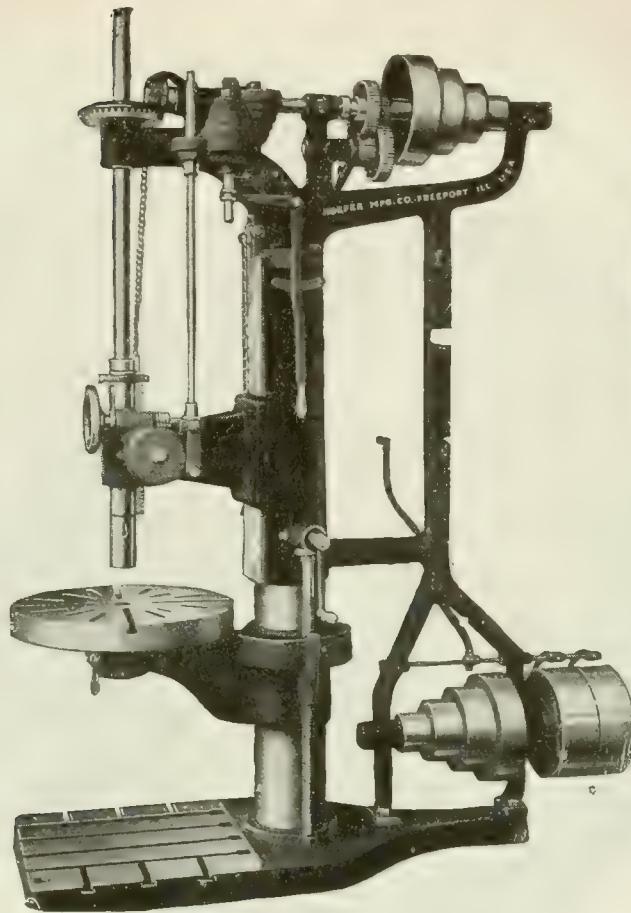
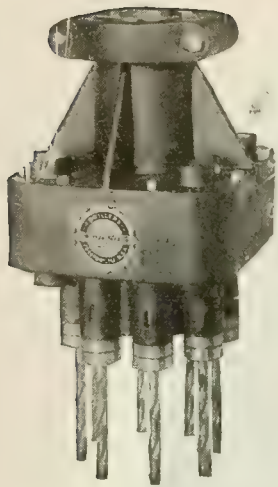
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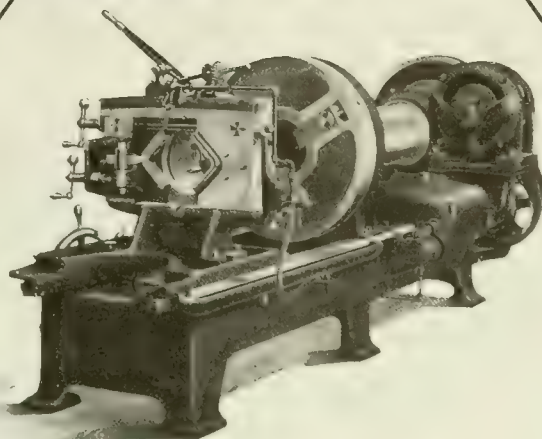
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CANADIAN MACHINERY AND MANUFACTURING NEWS

VOL. XXV. No. 18.

May 5, 1921

Surface Grinding 700 Ball Races Every Hour

Magnetic Chucks—Their Relation to Surface Grinding—Grinding Steel Forgings, Gear Blanks, Cylinder Castings, Locomotive Crank Pin Washers, Dies, Push Rods and Connecting Rods

By J. H. MOORE

BEFORE entering into the subject of surface grinding, let us first consider the system of holding the work for such style of grinding. It is a readily conceded fact that surface grinding would never have reached its present point of efficiency but for the development of the magnetic chuck; and yet, there are quite a few mechanics who still look at you in a puzzled manner the moment you ask them, "Why don't you use a magnetic chuck?"

Of course the field of usefulness of such chucks is not confined to grinding, for they are freely used in the shop, on planer and milling operations, but as we are especially interested in the grinding field (so far as this article is concerned), let us concentrate on this particular style of work.

Luckily, the magnetic chuck has been developed to such a point that it has literally forced itself upon industry in general. Its usefulness has been proven beyond a doubt, and results obtained have been so satisfactory that many industries could hardly get along without them. In spite of this, the chuck itself still remains to the men who use it daily a tool of mysterious holding power. Many tool makers, who ought to know better, still persist in the belief that such a chuck can hold flat pieces only, but for irregular shaped parts,—well to put it bluntly, they revert back to the vise. This is hardly fair to the chuck itself, or the principles involved, so without going too far into detail, let us ask the question, "What is a magnetic chuck?"

First of all, it is a device that will hold magnetically various shapes of work while machining operations are being performed. It is a labor and time saving factor that is rapidly proving its wide field of usefulness, and is being used not only in the tool room and machine shops, but in manufacturing trades in general.

These chucks were originally designed

to hold only flat pieces on which very light operations were performed. At that time they were considered merely as time saving factors in the tool room, and truth to state, were looked upon as rather risky factors at that. Development is a great thing, however, and now, when we speak of magnetic chucks, we refer to devices that will hold pieces of magnetic metal of almost any shape, this including even rough castings and forgings. We also know that the modern magnetic chuck is a device magnetically strong enough to hold pieces securely against the heavy strains that are brought to bear upon them by our modern production methods.

Such chucks are no longer accessories,

they are essentials, and a surface grinder, especially if used for production work, has a magnetic chuck as part of its equipment.

Of course, if such a chuck is used in manufacturing work, a sufficient number of duplicate pieces have to be passing through the shop to warrant the expense of special holding fixtures, that is, if the parts are of irregular shape. As surface grinders are to a large extent used on such work, the first cost of the holding fixture is nothing compared to the saving which results through its use.

To go into the various styles of chucks on the market would take a volume in itself. We are not so interested in the various makes, however, as we are in the

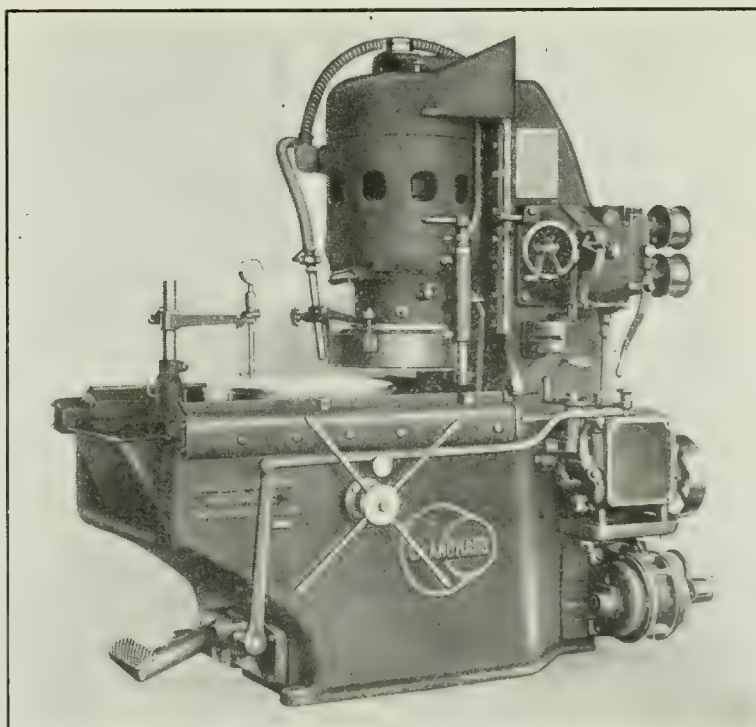


FIG. 1—GENERAL VIEW OF A SURFACE GRINDER.

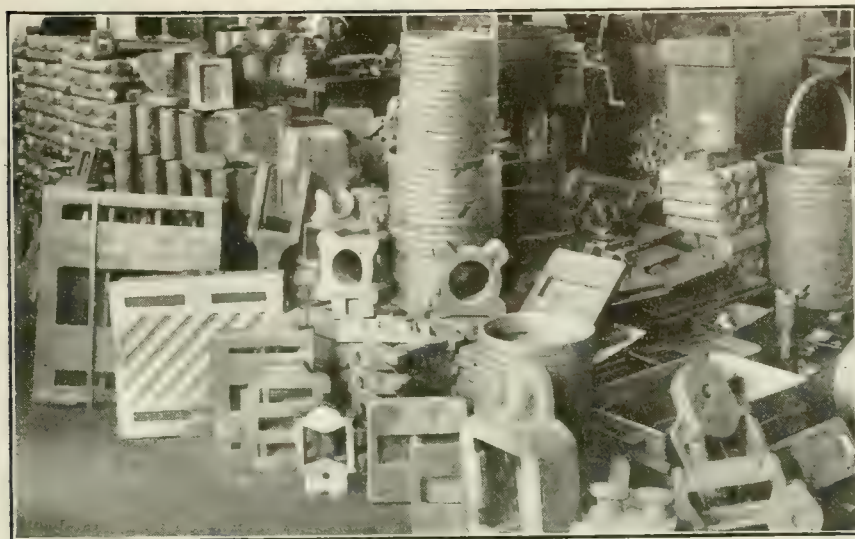


FIG. 2 A MISCELLANEOUS ASSORTMENT OF PARTS FINISHED BY SURFACE GRINDING.

work that they can accomplish, so feeling sure the shop superintendent, and mechanics in general, do not care to delve into the principles of magnetism, we will simply show how magnetic chucks have helped the cause of surface grinding.

Before proceeding to examples of work performed, let us discuss in a brief manner the term "surface grinding." This term in the minds of many shop men means finish-grinding, or grinding preliminary to lapping such work as dies, tools, gauges, small hardened parts, etc. This conception of the term was at one time quite correct, for the first style of surface grinder was intended for such work. These machines were used for the removal of a small amount of stock, usually hardened steel, and some of the machines were adapted for dry grinding only.

Times have changed, and now when we speak of surface grinding, we refer to the removal of stock at a high production rate. Grinding machines have of course been developed to a high point of efficiency to handle such work, and through the courtesy of the Blanchard Machine Co., Cambridge, Mass., we are able to present various examples of work produced by their practice. These examples are

picked at random, and illustrate in a general way the wide field of usefulness of this style of grinding. A word about the machine itself.

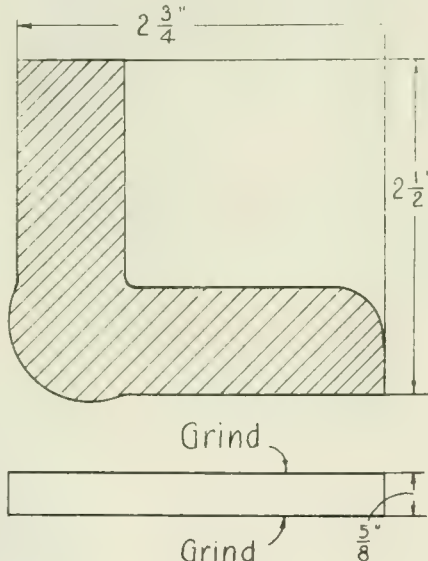


FIG. 4—DETAIL OF THE FORGING BEING GROUND AT FIG. 3.

Fig. 1 depicts a No. 16 Blanchard vertical surface grinder with a direct motor

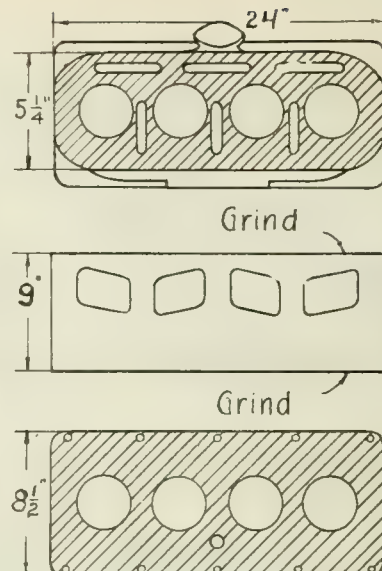


FIG. 6—DETAIL OF THE CYLINDER BEING GROUND AT FIG. 5.

drive. Without going into the constructional details, enough to say that the machine consists of a spindle, a suitable mounting for the spindle, a wheel, a table with a magnetic chuck, and various gear changes necessary to obtain the different speeds. Our chief reason for confining the details to this brief space is that anyone interested can write for further information, while by holding down the constructional details in this manner we can proceed with the work accomplished, which, after all, is the foreman's chief consideration.

Method of Procedure

The work to be ground is laid on the rotary magnetic chuck, and the switch closed. The entire table, comprising the chuck and the sliding carriage in which it and its driving mechanism are mounted is then moved by hand horizontally on the base to bring the center of the chuck just under the face of the cylinder wheel. In this position the chuck is rotated continuously. The water to inside of wheel is turned on, after which the wheel head is gradually fed downward, usually .001 inch to .002 inch per revolution of the work, until the desired size of work is reached. The wheel head is then raised enough so that the wheel will clear the



FIG. 3—SHOWING METHOD OF PLACING THE STEEL FORGINGS.



FIG. 5—GRINDING CYLINDER CASTINGS IN 'AUTOMOBILE PLANT.

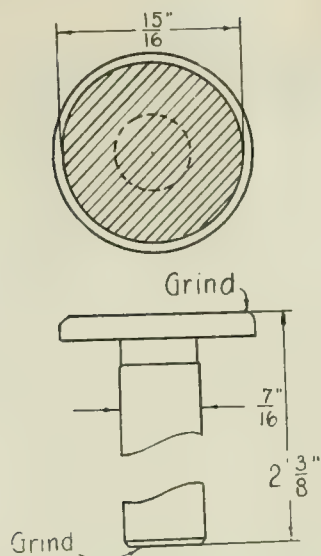


FIG. 8—DETAIL OF THE PUSH ROD.

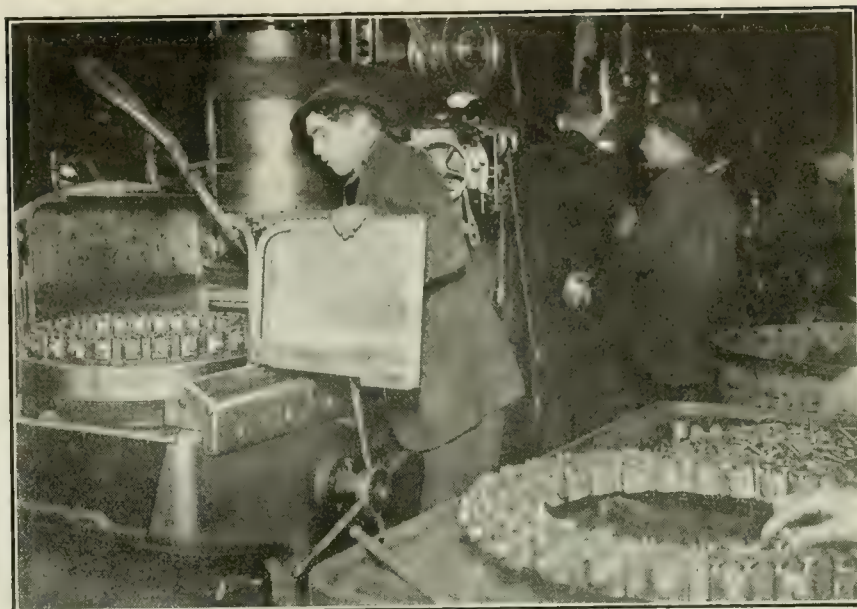


FIG. 7—GRINDING AUTOMOBILE PUSH RODS.

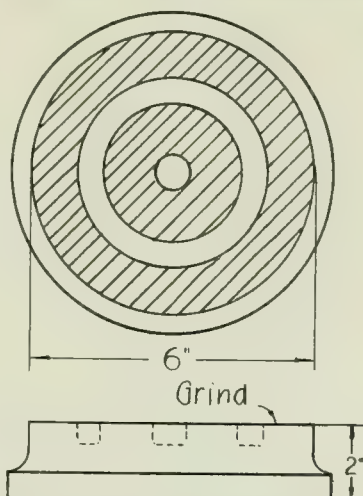


FIG. 10—DETAIL OF ARMATURE DIE.

next load of rough pieces, the chuck rotation is stopped, the chuck is moved horizontally out from under the wheel, and the finished work removed. Should the pieces have to be ground on both sides, they are reloaded the other side up, and again ground in similar manner. Should the parts be ground on one side only, the pieces are removed and fresh parts placed on the fixture or chuck. This, briefly, is the procedure adopted.

The wheels used differ in grade depending upon the nature of the work, but in every case, irrespective of the parts being ground, the wheel is a plain hollow ring of abrasive, mounted in a cast iron ring. It is left in this ring until worn out. We do not wish to take up further space on the machine itself, so leave readers to study Fig. 1 at their leisure.

In the meantime let us consider examples of work produced.

Examples of Work

Referring to Fig. 2, we see a miscellaneous group of parts machined by surface grinding. There is no need to speak on the variety of work shown in the photograph for it speaks for itself. Our main reason in showing such a group is to bring up the question, "What field is covered by surface grinding?" The extreme range of work possible to machine by this process makes it difficult to define the field, but generally speaking it is a process that will machine almost any flat surface unobstructed by projections. As the boosters of the method put it, "A process that obtains a finish and accuracy somewhat better than would result from a roughing cut made simply to remove metal." The field is constantly growing, new uses and applications being discovered daily.

Figs. 3 and 4 depict both the photographic and diagrammatic views of a steel forging, this piece being ground on a machine of the same size shown at Fig. 1; a 26 inch magnetic chuck being used. The stock removed per side is 1-16 inch, and the work is held to limits of plus or minus .0005 inch. As can be noted, the piece is ground on both sides, and the production on this forging is 326 surfaces, or 163 pieces per hour. This production was obtained without any special equipment, and proved to be a great saving on the previous method employed.

Figs. 5 and 6 depict the grinding of cylinder castings in a certain automotive plant. The same equipment, stated above, is used, and the piece itself, made from cast iron, weighs 90 pounds. The stock removed per side is from .015 inch to .020 inch, and the limits are plus and minus .003 inch. Two sides are ground, and the production is 32 surfaces or 16 pieces per hour. This figure is of course for one machine. These parts are rough

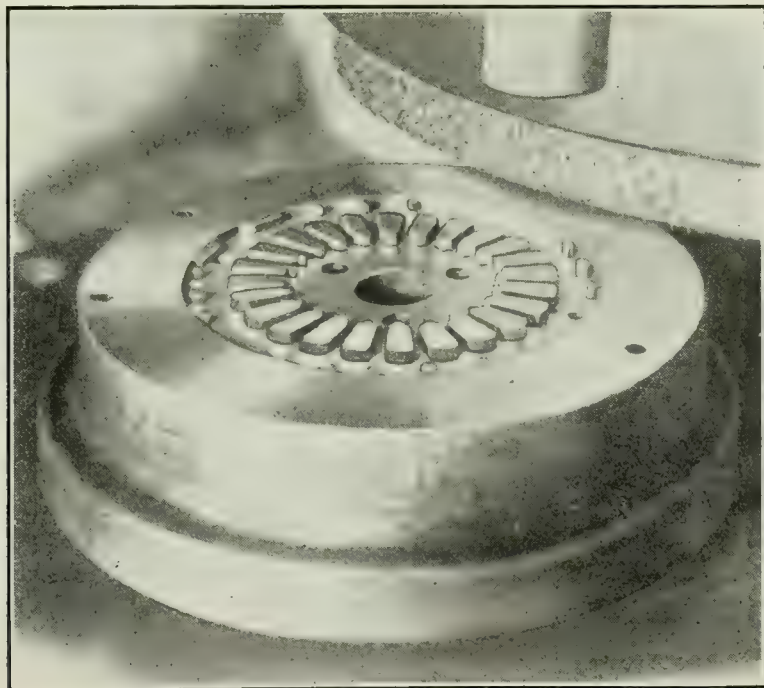


FIG. 9—GRINDING AN ARMATURE DIE.

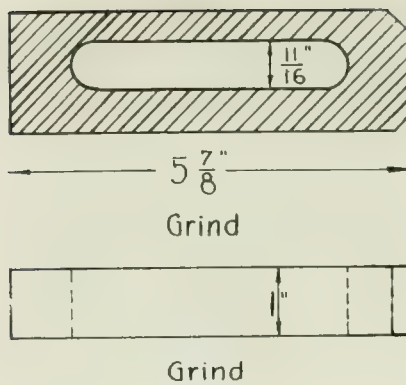


FIG. 12—DETAIL OF THE STEADY REST JAW.

milled before grinding, and the object of thus grinding is to give the part proper finish, accurate height, and at the same time making it easy to secure tight joints without using thick gaskets.

Figs. 7 and 8 illustrate the grinding of automobile push rods. The material is hardened steel, and the stock removed per side .015 inch. The limits are held to plus or minus .001 inch, and two sides are ground. The production is some 1,600 surfaces or over 800 pieces per hour. These rods have to be ground on both ends, to length, square with the shank. Fixtures are used which hold 104 rods each, the rods being clamped in V grooves, one bolt gripping four rods, two on the outside, and two on the inside. Three machines, six fixtures, and six men produce 2,500 rods per hour. This is not the highest possible figure, but is taken from an average production day.

Figs. 9 and 10 depict the grinding of an armature die. The material is of course hardened steel, .015 inch of stock per side being removed. No limits are necessary, the main stipulation being to clean up. The complete grinding of such a die occupies only four minutes.

Further Examples

Figs. 11 and 12 illustrate the grinding of some steady rest jaws, these being made of cast iron. The stock removed is 1-32 inch per side, and the work is held to plus or minus .0015 inch. Four sides are ground, and the production time is 100 surfaces or 25 jaws per hour. These

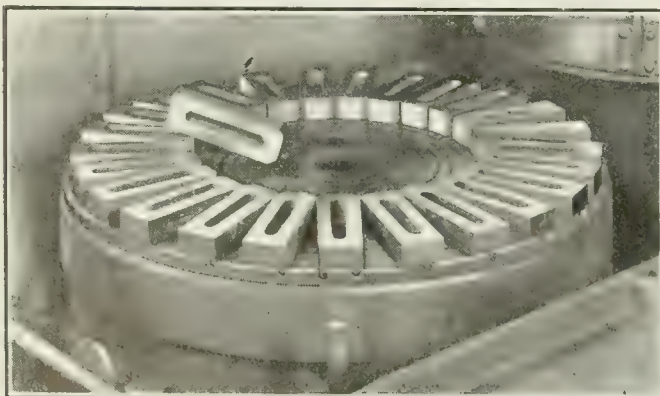


FIG. 11—GRINDING STEADY REST JAWS IN QUANTITY.

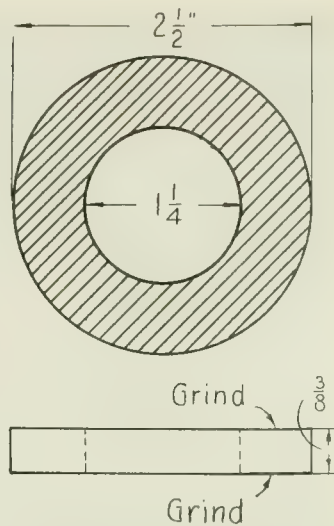


FIG. 14 DETAIL OF THE PACKING RING.

jaws must be parallel and square and are finished from the rough. The two parallel sides, viz., the operation shown

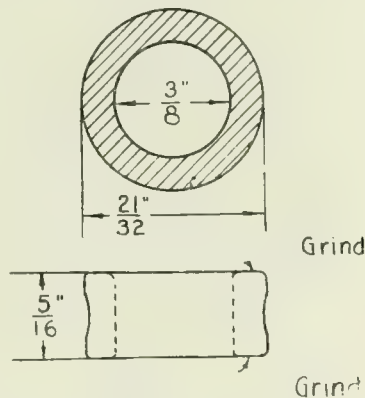


FIG. 18.—DETAIL OF THE BALL RACE.

in photograph, is done at the rate of 120 surfaces per hour. The pieces are then packed between square bars, or clamped

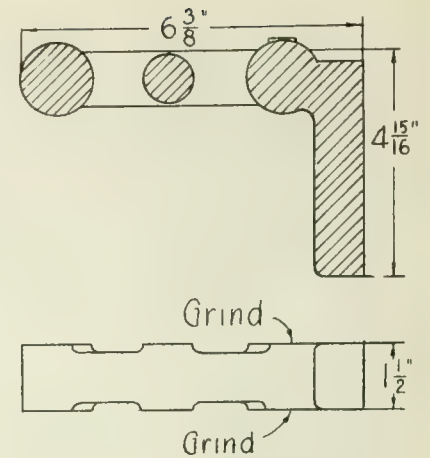


FIG. 16—DETAIL OF THE BRACKET SHOWN AT FIG. 15.

against vertical surfaces of a block, and one edge ground square with the two parallel sides. They are last of all placed with this squared edge on the chuck, and the second edge ground parallel to it.

Figs. 13 and 14 depict the grinding of some cast iron packing rings, the stock per side removed being 1-64 inch with limits of plus or minus .001 inch. Two sides are ground, the production being 270 surfaces or 135 rings per hour. This work is done on a smaller sized machine than those previous.

At Figs. 15 and 16 is shown the machining of cast iron brackets, the stock per side removed being 1-16 inch. The limits are held to plus or minus .001 inch, and two sides are ground. The production is 90 surfaces or 45 parts per hour.

A very interesting example of small work is shown at Figs. 17 and 18. These parts are hardened steel ball races and .007 inch stock per side is removed. The pieces are held to limits of plus or minus .005 inch, and two sides are ground. The production is 1,400 surfaces, or 700



FIG. 13—GRINDING PACKING RINGS.

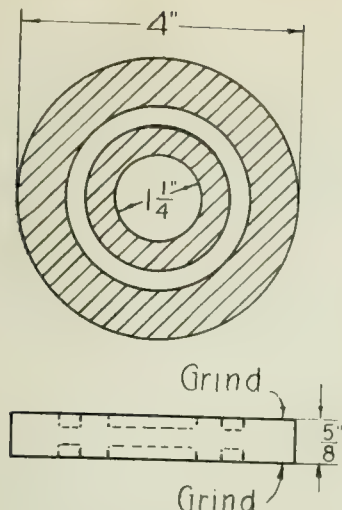


FIG. 19 DETAIL OF A GEAR BLANK GROUND.

paces per hour. This production is for one man only operating the machine. A man with a helper operating the machine and using plates for loading and a rapid washing device (the helper loading the plate while the machine is grinding) produces 3,600 pieces per hour. In the illustration the work is retained by inner and outer rings, this being the standard method of chucking small pieces.

Diagrammatic Views

The remaining illustrations will be confined to drawings only. Fig. 29 depicts a gear blank made from soft alloy steel, 1-16 inch stock per side being removed. The work is held to limits of plus or minus .001 inch, and the blanks must be parallel to within .005 inch; 150 per hour is the production figure.

Fig. 20 depicts a locomotive crank pin washer $7\frac{3}{4}$ inches outside diameter made from hardened steel. Both sides of this washer are ground, .032 inch being removed from each side. The work is held to limits of plus or minus .005 inch, and 180 surfaces, or 90 complete washers are completed per hour. This is only one example of locomotive work, but such parts as slide valves, piston rings, link plates, ball couplings, link blocks, main

links, radius rods, guide liners, wedges, main rod keys, etc., have been machined by this process with splendid success.

Fig. 21 shows a rather good example of die grinding, this being a crankshaft

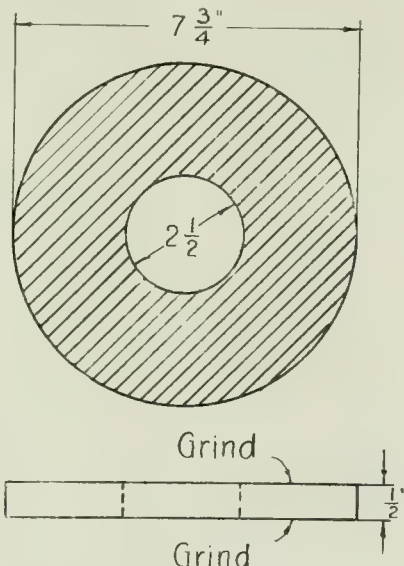


FIG. 20-A LOCOMOTIVE CRANK PIN WASHER THAT IS GROUND.

forging die. The material is hardened steel, and .012 inch is removed. The die has merely to be cleared up and the grinding takes only 10 minutes.

The gear box shown at Fig. 22 is made

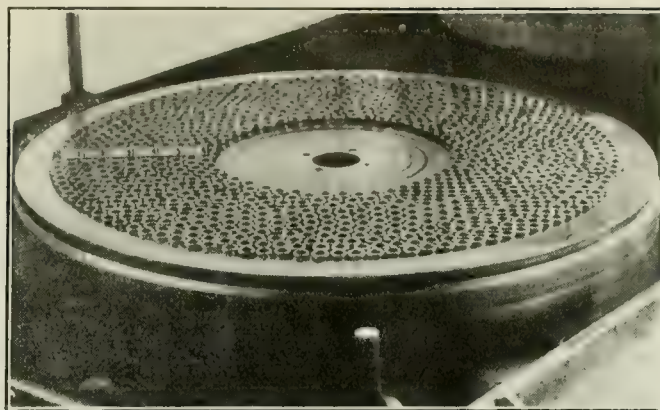


FIG. 17-GRINDING BALL RACES.

of cast iron, $\frac{1}{4}$ inch of stock being removed. No limits are given, the work being merely cleaned up. Of course, a special fixture is necessary, but the design is lighter and the cost less in this case than it would be for a milling or planing fixture. The parts need not be clamped, unless there is a tendency to tip, and then only a very light form of clamping is necessary. Six pieces per hour is the production figure on this particular work.

Fig. 23 shows a connecting rod made from a steel forging that lends itself nicely to grinding. The points ground are shown in sketch, .050 inch stock being removed per side. The work is held to plus or minus .001 inch, and the production per hour is 216 surfaces, or 54 rods per hour.

As the surfaces of the large and small ends of these rods are not at the same level, they are chucked in approximately radial position with the thick ends toward the center of the chuck. After grinding these ends, the chuck is moved out until they clear the wheel, when the wheel is then brought down to grind the thin, small ends. Of course the same procedure is adopted when the rods are turned over in the fixture.

The last example, that at Fig. 24, depicts a reamer blade ground on a No. 10 grinder, using a 16 inch chuck. The material is hardened steel, the stock removed per side being .020 inch. The work is held to limits of plus or minus .0005 inch and, as can be noted, two sides are ground; 660 surfaces, or 330 blades per hour are produced.

We could go on indefinitely illustrating examples of work completed by surface grinding, but sufficient has been shown to not only prove the effectiveness of the process, but its wide scope.

Before leaving the subject, however, let us dwell on a few points of general interest. Speaking on this method of grinding, the Blanchard Co. have the following to say:

It is obvious that to obtain a succession of light cuts economically it is necessary to have a high work speed. This is readily obtained on a rotary chuck type of surface grinder, because the chuck revolves continuously in one direc-

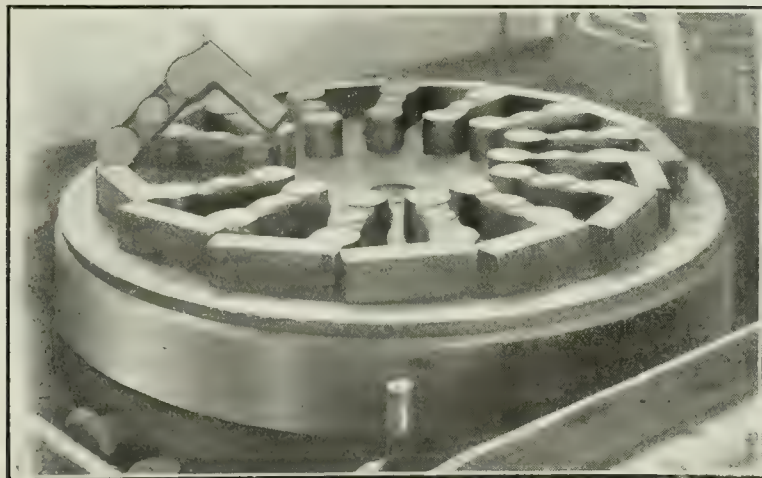


FIG. 15-GRINDING SOME CAST IRON BRACKETS.

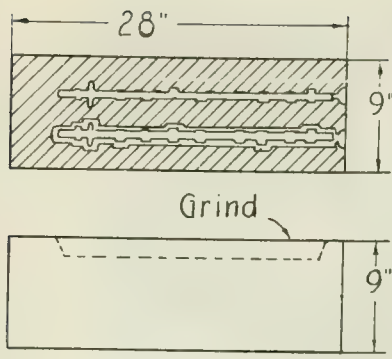


FIG. 21—A CAMSHAFT FORGING DIE, GROUND WITH SUCCESS.

tion and there is no need for any reversing mechanism such as is used on planer type machines. To rotate the chuck say at 28 r.p.m. (which corresponds to 140 feet per minute) requires no elaborate mechanism, and the action of the wheel when fed .001 inch 28 times a minute is much better than when it is fed .005 inch five times a minute. Furthermore, a high work speed greatly facilitates keeping the work cool, for it reduces the time that any particular point on the work remains under the wheel. When a broad surface is being ground, the work under the wheel is difficult to reach with any large volume of coolant, while that out of contact with the wheel is readily supplied.

Coolant System

For accuracy on any work, and to permit rapid grinding of hardened material, the work must be kept cool at all times. If work is ground dry, the grinding must be done slowly so that the heat generated may be carried away by the parts of the machine and the surrounding air. Therefore on our system all grinding of metal is done wet. This means more than merely flooding the work with

water after it comes out from under the wheel, for to heat the work and then suddenly cool it is perhaps worse than letting it remain hot. The water system applies the water where the heat is generated—between the wheel and the work—and absorbs it before the work can become heated. Water is supplied by a one-inch pipe to a passage in the wheel head from which it enters the faceplate carrying the wheel. In the passages of this faceplate it is whirled at the full speed of the wheel and issues from under the cutting face of the wheel with force sufficient to carry it between the wheel and the work in considerable volume. To increase the cooling available on broad

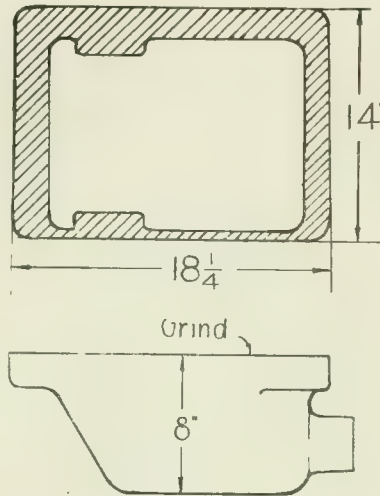


FIG. 22—A GEAR BOX GROUND BY THE SURFACE METHOD.

surfaces, an auxiliary nozzle is used which floods the work clear of the wheel. The base of the machine serves as the tank for the water and holds 65 gallons. The water passes from this main tank through a removable gate that holds

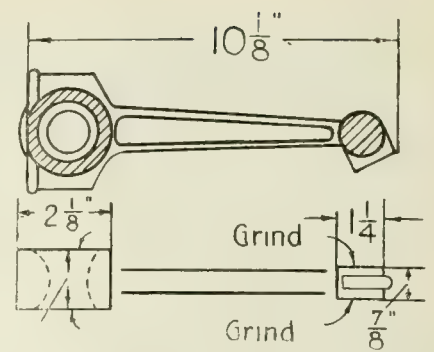


FIG. 23—CONNECTING RODS CAN BE GROUND VERY READILY, AS CAN BE NOTED FROM THIS SKETCH.

back both the mud at the bottom and any floating dirt into the pump tank at the rear. There a submerged centrifugal pump forces the water to the wheel head and to the outside nozzle. It is interesting to note that the most satisfactory results have been obtained by the use of a solution of seven pounds of soda ash in fifty gallons of water. To this, when grinding steel, one or two quarts of cutting oil may be added, but on cast iron it is advisable to use only the soda and water. Numerous grinding compounds have been tried, but have been unsatisfactory for one or more of the following reasons:

1. They foam so as to overflow the tank.
2. Are opaque and prevent operator from seeing work.
3. They prevent good wheel action on hardened steel.
4. They mix with cast iron chips and form a paste. It should be remembered in this connection that the wheel contact on a surface grinder is very high, being sometimes as great as 25 square inches.

The Chuck

Next to the spindle, the chuck is probably the most vital part of a surface

MATERIAL	WIDTH OF SURFACE	FINDER FINDER AND NARROWER SURFACES			FASTER CUTTING AND BROADER SURFACES			FINDER FINDER AND NARROWER SURFACES			FASTER CUTTING AND BROADER SURFACES		
		30-H	20-I	14-H	30-H	20-I	14-I	30-H	20-I	14-I	30-H	20-I	14-I
NORTON CRYSTOLON													
Cast Iron	Narrow Medium Broad	30-H 30-G	20-I 20-H 14-H	14-H				30-G	20-I 20-H 14-H				14-I
Chilled Iron	Narrow Medium Broad		20-I 20-H 14-H					30-G	20-I 20-H 14-H				
Bronze	Narrow Medium Broad		20-I 20-H 14-H	14-I				30-G	20-I 20-H 14-H				14-I 14-H
Aluminum	Narrow Medium Broad								20-I 20-H 14-H				
NORTON SILICATE NO. 38 ALUMINUM													
Malleable Iron	Narrow Medium Broad		1824 I 1824 H 1810 G					30-I 30-I 40 1/2	24 1/4 24-I 24-I				
Soft Steel	Narrow Medium Broad		3830 I 3840-H 1824 H	1824 I 3824 H 1814 I	3814-I			30-I 30-I 40 1/2	24 1/4 24-I 24 I				14-I
Steel Castings	Narrow Medium Broad		1824 I 1824-H 3830-G	1824 I 1824-H	3814 I			40 1/2	24 1/4 24-I 24-I				
Hardened Carbon Steel	Narrow Medium Broad		3840 H 3830-G 3830-G	1824 H 3830-G 3830-G	1824 H				30-I 30 1/2 30 1/2				24-I
Hardened High speed Steel	Narrow Medium Broad		1824 H 1824-G 3840-G	1824 H 1824-G 3840-G					30-I 30 1/2 30 1/2				

TABLE NO. 1—WHEELS WHICH HAVE BEEN USED WITH GOOD SUCCESS.

THE ECONOMY OF USING SOFT, FREE-CUTTING WHEELS

Data:—

Production per hour	Hard Wheel	Soft Wheel
Life of wheel	150 pcs.	200 pcs.
No. of pieces ground by one wheel	75 hrs.	50 hrs.
	11250 pcs.	10000 pcs.

Example 1—Taking labor at 55c, burden 100% or 55c

	Costs per 1,000 pieces ground	
Wheel cost at \$20 per wheel	\$1.78	\$2.00
Labor one man at 55c per hour	3.66	2.75
Burden at 55c per hour	3.66	2.75

Total, per 1,000 pieces	\$9.10	\$7.50
Saving, by using soft wheel	\$1.60 per 1,000 pcs.	
	\$2.88 per day, 9 hrs.	
	\$864.00 per year, one shift.	

Example 2—Taking labor at 75c, burden 166% or \$1.25

	Costs per 1,000 pieces ground	
Wheel cost at \$20 per wheel	\$1.78	\$2.00
Labor one man at 75c per hour	5.00	3.75
Burden at \$1.25 per hour	8.34	6.25

Total, per 1,000 pieces	\$15.12	\$12.00
Saving, by using soft wheel	\$3.12 per 1,000 pcs.	
	\$5.62 per day, 9 hours.	
	\$1,686.00 per year, one shift.	

TABLE NO. 2—SHOWING THE SAVING EFFECTED BY USING SOFT, FREE-CUTTING WHEELS.

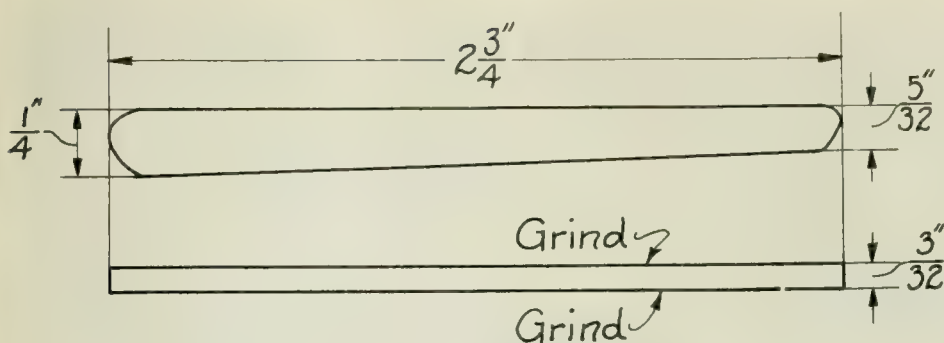


FIG. 24—REAMER BLADE SUCCESSFULLY GROUND.

grinder. The chuck bodies on our machines are made from a solid disc of forged steel in which are machined on one side large concentric grooves to receive the coils, and on the other side numerous small grooves which are later filled with hard brass strip. This leaves a continuous layer of steel extending under the entire face of the chuck, making leakage of water into the coils an absolute impossibility. The coils are form wound, vacuum impregnated, and are sealed in place with an insulating compound, making the completed chuck solid, with no air spaces. This eliminates trouble from sweating and does away with the need for ventilation of the chuck.

The working face is composed of steel and brass in alternate rings. So close is the spacing of the steel poles that a piece of work as small as a 25-cent piece will touch two or more poles, no matter where placed. The chuck will hold large or small pieces equally well, and once ground true will remain much longer in this condition than chucks having cast-iron and soft metal in the face. Also the annoyance due to grit charging the soft metal and making bad scratches on the work cannot occur when the chuck is of the construction spoken of. Owing to

the close spacing of poles, it is not necessary to provide perforated plates for locating any but the smallest work.

Wheels Used

Little has been said up to the present concerning the grinding wheels used, beyond indicating that the soft, free-cutting wheel is the most satisfactory. Not only is a soft wheel satisfactory from the viewpoint of the production manager but it is the most economical wheel when studied from the desk of the cost accountant. The first reason for satisfaction with a soft wheel may be explained in this manner:

Any one grain of abrasive in the grinding wheel should cut until it loses its cutting edge, and then it should either fracture and present a new edge, or be torn from the wheel by the increased friction due to its dull edge. If the bond of the wheel is so strong that the grain must get exceedingly dull before it is dislodged (i.e., if the wheel is hard) much power is absorbed in useless friction, for the grain rubs but does not cut. These dull grains not only waste power but their presence reduces the number of effective grains in the wheel face, and so reduces the rate at which metal can be removed from the work.

Considering this same subject from the cost standpoint, let us show some figures in table No. 1 gathered from an actual machine operation to prove the point.

It should be remembered that this is not the most striking case of the economy of free-cutting wheels, but is an average example, also that in a wheel which is altogether too soft the grains are torn out before they become dull and are thus wasted. At table No. 2 is shown a tabulated list of the grains and grades of the wheels which we have found satisfactory on certain work.

ORGANIZED MOTORING

As an example of the degree to which motoring in Great Britain has been organized—wholly by private enterprise—the “sentry boxes” instituted at various points along the main country roads by the automobile association are very striking. The sentries on duty at these boxes provide information on routes, road conditions, hotels, and so on, to motorists, and they are also available to assist in repairing breakdowns or in securing relief cars with the utmost promptitude. The boxes are provided with telephones. A short time ago the members of the association were provided with keys to enable them to open the boxes and use the telephones during the hours when the sentries were not on duty. The latest development is to illuminate each box so that its position may be readily discovered after dark.

In a certain plant, where polishing is a major operation, a special work bench of grated construction is used. Not only is the polishing completed on this bench, but the dust is immediately drawn down through the grating. The air is perfectly clear, thus the bench serves a double purpose.

Sheet Metal Work

Development of Funnel and Spout

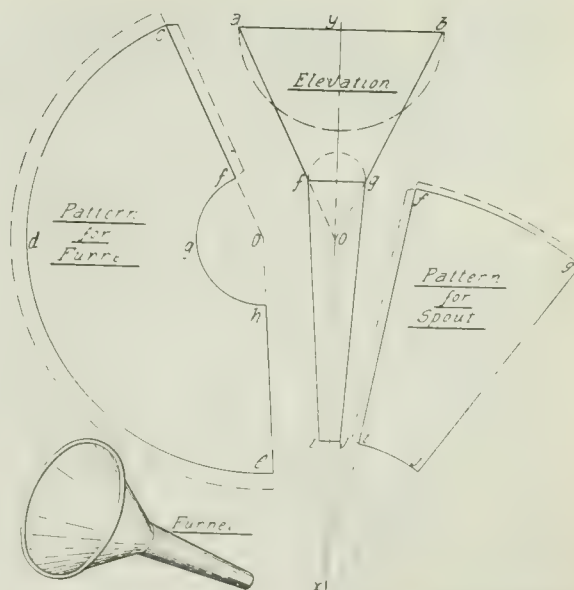
Sketch shows elevation (centre) and the developed patterns for the funnel (left) and the spout (right).

The elevation, giving the necessary dimensions is first drawn, using the centre line X Y as a base. The sides are prolonged until they cut the centre line at O and X. With O as a centre and radius O A, describe the arc C D E, also the arc F G H, the latter with a radius F G. Make the arc C D E equal to the circumference of the mouth of the funnel and complete the pattern by drawing the necessary radii at each end.

The spout pattern is developed in the same way, using X as a centre with the radii as shown.

For wiring and seaming purposes additional metal is added, as indicated by the dotted lines.

If dies are to be made for punching out the blanks, it is well to make a few samples by hand before deciding on the final shape.



Canadian Machinery

Manufacturing a Lightning Mixer and Beater

Production Methods Must Be As Low As Possible—Various Dies Used Including Blanking and Forming—Depressing and Trimming, Also Piercing and Marking—Effective Twisting Fixture

By ROBERT MAWSON

IT is a well-known fact that to make a household necessity a success the price must be as low as possible. This in turn means that the production methods must be as economical as possible for otherwise the price could not be kept down.

The article to follow describes the operations followed out in manufacturing a certain kitchen convenience, known as the Roberts lightning mixer and beater. According to the maker's claims, it can be used to beat eggs, whip cream, mix mayonnaise, churn butter and other such tasks. However, we are not so much interested in its qualities as we are in the method of its manufacture. In order, however, that readers can form some idea of its general appearance we show the device at Fig. 2.

Actual Operations

Fig. 2 depicts the punch and die employed to blank and form the cover. The punch B is made with a similar contour to that of the cover and is held by means of a shank in the ram of the punch press. The die is held rigidly on the table of the machine with two bolts fitting in the slots of the base. The strip steel is fed between the punch and

die and, as the former descends, the material is blanked out. The outside diameter of the punch is a good sliding fit inside the steel ring of the die B, this accounting for the operation. As the punch continues to descend, the blank is formed between the hollow portion of the punch and the sliding plunger D of the die.

This plunger has a shank which passes through the base of the die and is held so that it cannot come out with nuts. Between these nuts and the large diameter of the plunger are placed a series of rubber discs. As the punch is fed down, the blank is formed, the rubber discs being compressed, but as the punch returns these discs resume their original thickness and raise the plunger D. This in turn forces the blanked and formed cover out of the die so that it can be easily removed by the operator. One of the covers after the operation described is illustrated at E.

The cover is then placed on the die, Fig. 3, being located by means of the four stops A, and the next operation of forming depression and trimming is performed.

The punch B is held in the ram of

press in the usual manner, and, as it is fed down, it first trims off the outside edge. The machine in which this operation is performed is of the double acting type, and the second stroke forces down the ram or former C, thus making the depression in the cover.

The punch is also provided with a cutting tool D, which slits the portion of the cover trimmed off, and as these slit sections build up on the punch they automatically fall away from the tool, or, if need be, can be easily removed by the operator.

The illustration, Fig. 4, shows the tools for piercing the centre hole and marking. The cover A is placed on the die after it has been fastened securely on the table of the press, and the punch attached in the machine ram. The punch is then fed down and the hole pierced and the letters formed on the cover as shown by the sample A. This completes the operations on the cover.

The first operation when making the dasher is blanking and punching the holes, and the tools employed are illustrated in Fig. 5. The strip is fed over the die A, which is held in a bolster on the punch-press table. It will be noticed that the various piercing tools used are



FIG. 1—COMPLETED ARTICLE.

FIG. 8—FIXTURE FOR TWISTING THE STEM.

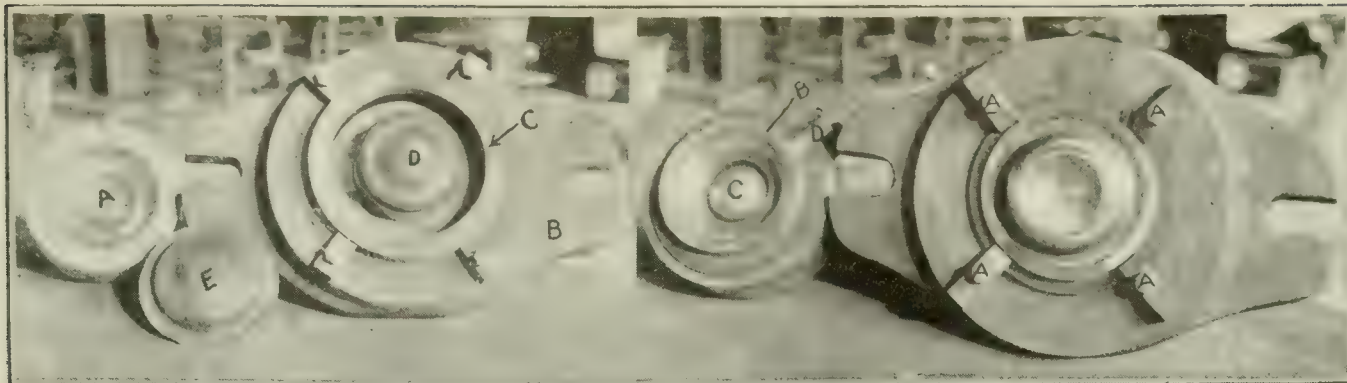


FIG. 2.—BLANKING AND FORMING COVER

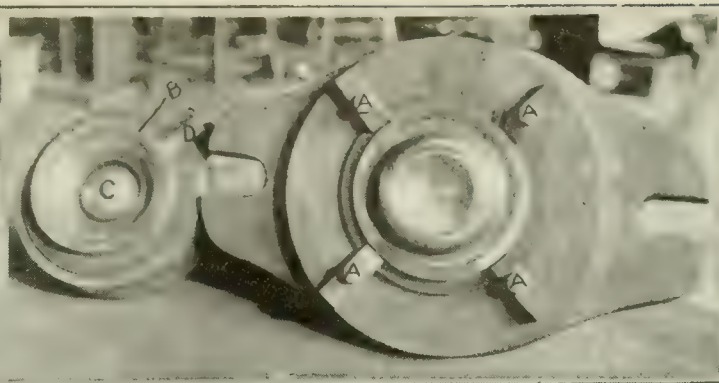


FIG. 3.—FORMING DEPRESSION AND TRIMMING.

carried in the die, the cross-shaped section being made a sliding fit in the die and operated by rubber pads as previously described.

The punch is then fed down and it first blanks out the dasher, and, as this is pushed down with the continued stroke, the holes are then punched out by means of stationary tools in the die. The stripper plate C is held between the punch and die and removes the part as the punch is drawn back with the ma-

pression shown in the centre of the dasher C. The tools are held in the machine in a similar manner to that already described.

When making the stem the material is purchased in a rectangular form of the proper dimensions and is fed into the die shown at Fig. 7 against the stop B, which is made adjustable so that this tool may be used for making stems for both the pint and quart sizes.

The punch C is then fed down with

However, the duty that it has to perform is only light and it answers the purpose very well.

The dasher is first riveted on to the stem, using a standard machine for the work. This is then placed into the fixture with the dasher resting against the end A. The headless set screw B is next tightened to hold the stem rigidly.

The free end of the stem sets into a slotted portion of the chuck C, the handle D is then given two and a half

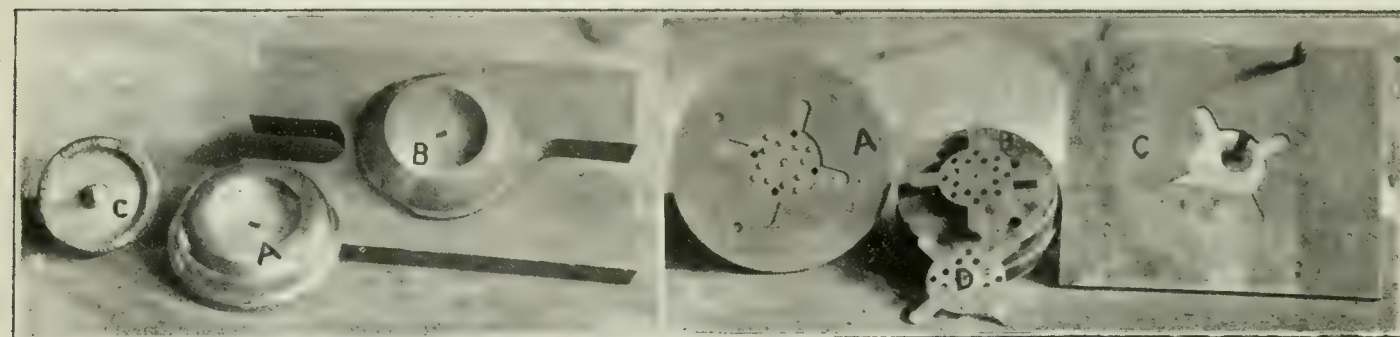


FIG. 4.—PUNCHING HOLE AND STAMPING.

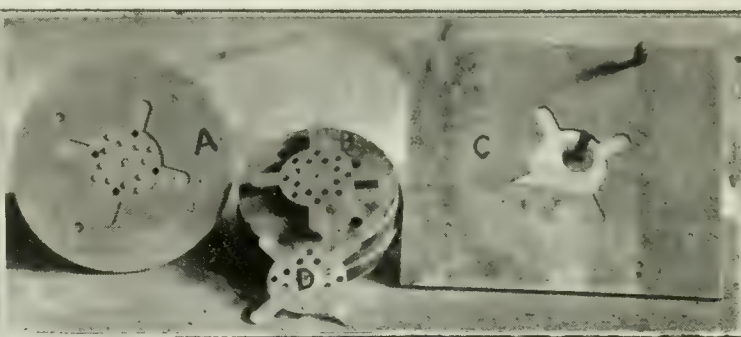


FIG. 5.—BLANKING AND PIERCING DASHER.

chine. One of the dashers after going through these operations is shown at D.

Forming Depression

The part is now ready for the next operation, which is bending prongs and forming depression, and the tools used are shown in Fig. 6. The blank is placed in die A and the punch B fed down with the press. This action first bends back the prongs, and the continuation of the stroke makes the de-

pression shown in the centre of the dasher C. The tools are held in the machine in a similar manner to that already described.

A somewhat crude tool is used for the next operation, which is twisting the stem, and is illustrated in Fig. 8.

revolutions, and, as the handle comes in contact with the driver E, the stem is twisted to the shape shown by the sample F.

The twisted stem is next placed through the slot in the cover and a porcelain knob riveted on. The various parts now assume the condition of the finished work and only require placing on to one of the glass containers when the device is ready for service.

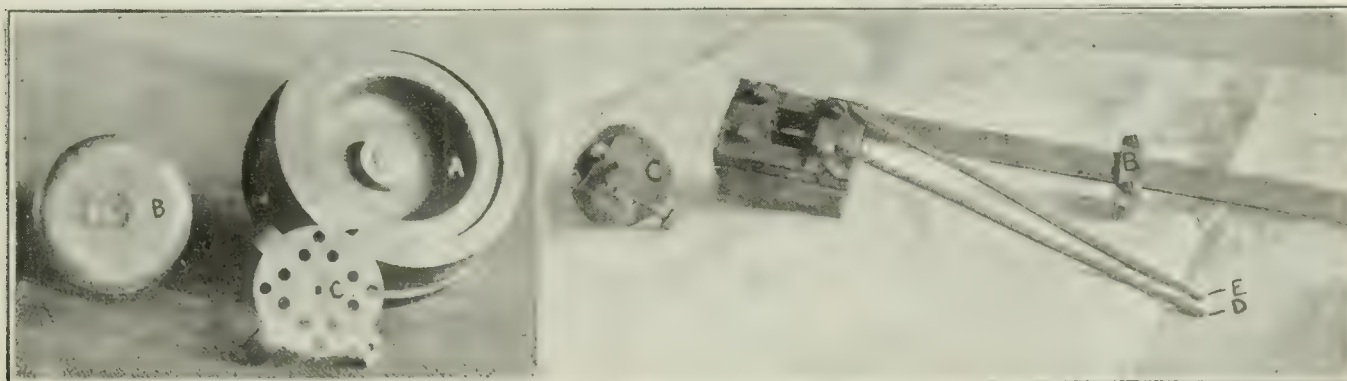


FIG. 6.—BENDING AND FORMING DEPRESSION.

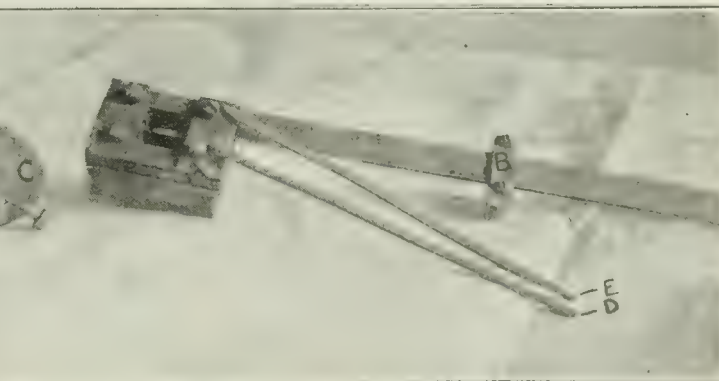


FIG. 7.—BLANKING NOTCHES IN STEM.



WHAT OUR READERS THINK AND DO



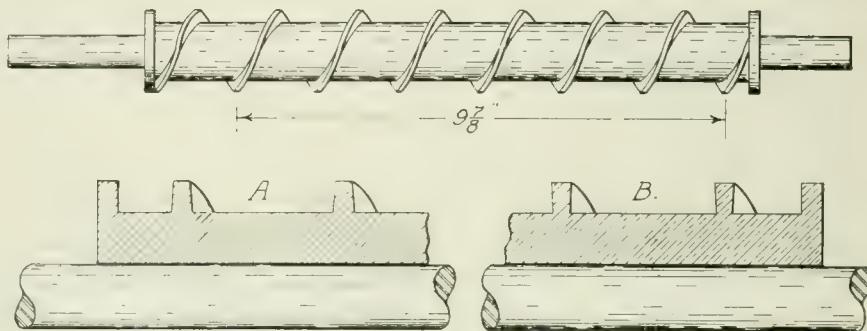
GRINDING LOCOMOTIVE GUIDE BARS.

By F. C. H.

The jig as shown was designed to facilitate the grinding of locomotive repair guide bars. It is the practice, at least it is our practice, to remove as little as possible from the wearing face of the bar. To accomplish this it is often necessary to throw the bar out of line, or out of square, with the other machined surfaces of the guide bar, to square the wearing face with the grinding wheel.

These guide bars were previously secured to table with ordinary clamps, bolts and packing, and to make the necessary adjustment to square wearing face of bar to wheel it necessitated the slacking off of bolts and clamps at each adjustment, often requiring several trials before final adjustment was made. With the aid of these jigs, of which there are two, each being composed of a base secured to machine table, the one which holds the bar being attached to the base by knuckle pin A, the time required to set bars was reduced considerably.

The guide bar is placed in jigs as



WE DESIRE AS MANY REPLIES AS POSSIBLE ON THIS SCREW CUTTING QUERY.

shown, set pins B allow the guide bar to be moved towards wheel at either end to bring same in alignment with wheel, while set pins C allow guide bar to be set over or tilted to square the wearing face of bar with the wheel. The nut on stud D is tightened after each adjustment.

SCREW CUTTING QUERY

By J. H. R.

The sketch herewith shows a brass roll cast upon a steel shaft. These rolls were intended for use on a corn husker, and it was required to insert a strip of rubber

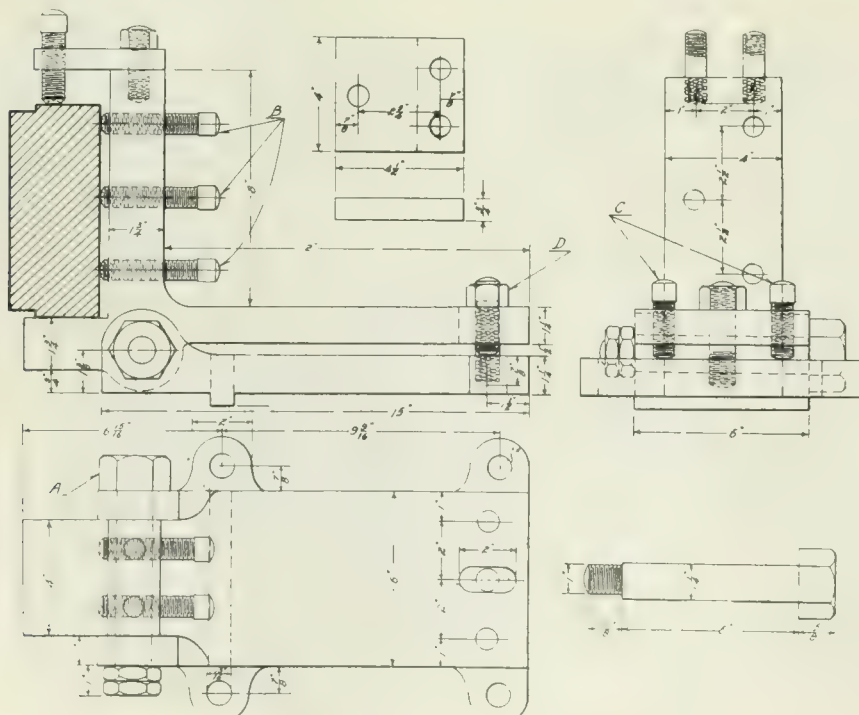
between the helical rib throughout the entire length. As the casting came from the foundry the rib had a slight draft as shown at (A), but in order to provide a better grip for the rubber, it was decided to under cut the rib as at (B).

After measuring up the pitch of the rough casting it was found that this was approximately six turns in $9\frac{7}{8}$ inches. This was a pitch of 1.6458 inches. On a lathe with a four thread lead screw, and a range of change gears from 20 to 80 (advancing by 5), including one of 69 teeth, what gears would be best suited for facing off the sides of the rib? If a new gear had to be made, what number of teeth would give the greatest accuracy?

Replies from readers on the solution of this problem—or any of similar character—would be appreciated.—Editor.

COLOR VERSUS HARDNESS

Quite often a workman spends considerable time in carefully drawing the temper of a piece of carbon steel, only to find to his dismay that it is soft, while yet the color is real light brown! It upsets his ideas of steel and hardening. Really, the trouble is that the piece was not hard when taken from the water. Either it was not hot enough to harden when dipped, or else it was removed from the bath too soon and drew itself before the black was polished off. Test the piece as soon as taken out of the hardening bath—it is quite apt to prove soft. Remember that the same colors can be produced on a piece of mild steel but they do not indicate a state of hardness.



DETAILS OF THE GUIDE BAR GRINDING FIXTURE.

GRINDING AUTOMOBILE DRIVE GEARS

By A. J. QUINLAN

The drawing herewith illustrates a neat method of setting and holding a drive gear in a Heald, or other internal grinding machine, when grinding the bore. The finished bore must be concentric with the pitch circumference of the teeth, and as the teeth are cut with the blank held on an arbor closely fitting the bore in the "green" size, it is evident that the gear is located from the same bore for grinding the final size, and this will bring the bore concentric, provided that the heat treatment has not disturbed the relation of the pitch circumference to the bore, or warped the gear out of round. When the heat treating is properly done the percentage of gears so distorted is very small.

The grinding fixture shown is made from a standard magnetic chuck. A hole was bored through the center and a brass bushing (3) pressed in. Inside this is pressed a hardened steel bushing which is ground dead true after the chuck is in place on the machine spindle. The brass bushing obstructs the magnetic lines. The steel bushing forms the bearing for the locating gauge composed of the shank (2) and the plate (1).

On the face of the chuck are fastened 18 steel blocks, which are really extensions of the small magnets embedded in the face of the chuck. These blocks hold the gear one inch out from the face of the chuck, allowing grinding wheel clearance after the gauge plate has been pulled back against the face of the chuck, by the draw bar operating through the spindle of the machine. These blocks are pack hardened machinery steel and the faces in contact with

the chuck magnets have the "case" ground off to expose the soft core directly to the magnetic lines. A ring of babbitt is poured around the blocks, covering all but the working faces, to prevent the accumulation of chips. The face is ground off smooth and flush. The gauge plate (1) is ground cone-shaped and has three locating spots on which the gear is centered. The switch is then thrown in and the gauge plate pulled back to the face of the chuck, leaving the gear ready for grinding. This outfit is very fast, the operation being measured in seconds. The fixture is adaptable to different sizes of gears by simply changing the gauge plate (1) to the size of the piece to be ground.

FORCING HOME A PISTON HEAD

A nut that came off inside the cylinder brought us the job of making a new rod and piston. We made a splendid fit of these but we had no good way of getting the head clear up to the shoulder on the rod. There was no press within fifty miles and we knew that we would injure something if we used the 24-lb. sledge as a "persuader."

Finally we jarred the head on. It was already within an inch of the shoulder and we turned the assembly, head in the air, resting the cross head end of the rod on a piece of 3" x 12" maple plank. A length of rope to the roof truss prevented it from toppling and acted as a safety. A foot of 4" pipe secured to the plank guided the lower end. Then four good men lifted the job about 6" at a time and let it drop, soon getting the desired position with this 200-lb. head.

CLEANING BURRS FROM THREADS

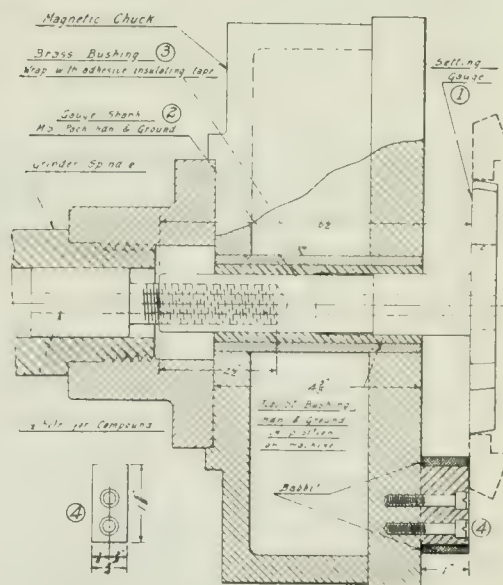
We had a screw used in our manufacturing that was milled flat across the end after it came from the automatics. The amount removed varied from 1/16 to 1/8, which was necessary to bring the starting of the thread in relation to other parts. After milling, the burr had to be entirely removed from the last thread to facilitate assembling. This was a slow, laborious job as accomplished with a file. The thread was a special 29 degree type.

The head of the department hit upon a scheme for removing these burrs that is worthy of wider use. We had sectional wire brushes, eight inches in diameter, that were used to clean up discolored drawn brass and steel parts and were discarded when worn within half an inch of the flanges which retained the bristles. A section of such a worn brush lying around served as the germ of the idea that proved so successful. One of these mounted on an emery stand became instantly a flexible, revolving file. With the screws resting in a V rest just at one side of the brush, they were revolved by hand against the wire brush and every particle of burr cleaned from the thread in an instant. The little burr thrown up, or left, on the end of the screw was unimportant. Ninety-five per cent. of the former time was saved and a better grade of work performed.

The city of Hamilton is being urged by the local Hydro department to build a city hall annex at an estimated cost of \$225,000.

Grinding Automobile Drive Gears

Sketch shows the arrangement of a magnetic chuck for the grinding of automobile drive gears. The chuck is bored to receive the brass bush (3) which is covered with insulating tape to break the magnetic lines. The steel bushing is pressed in and afterwards ground in position to a push fit for the gauge shank (2), on the front of which is secured the gauge plate (1). This plate has three locating spots to set the gear concentric. Eighteen small hardened blocks (4) are fastened to the chuck face. These blocks are completely enclosed in babbitt to eliminate the possibility of adhesion of chips. The gauge shank is threaded to the draw rod so that the gauge plate (1) can be drawn back after the gear has been placed in position and the switch thrown in. This device provides both accurate and rapid setting of the work. Gauge plates of different sizes may be made if desired.





WELDING AND CUTTING



Welding Irregular Shaped Fresh Water Tanks

Range and Application of Electric Arc Welding Constantly Growing Wider—Repairing Air Compressor Cylinder by Studing Process—Welding Small Vertical Engine Frame

By R. E. SMYTHIES*

THIS article deals with autogenous welding by the electric arc process as distinct from electric butt and spot welding. In passing, it may be mentioned that butt welding is an unfortunate expression, by which we mean that it is misleading and ambiguous. It is used promiscuously to designate the joining of two pieces of bar stock by the resistance-welding process, and the joining of the butting edges of two steel plates, for instance, by the electric arc process. It is a pity that we ever got away from the technically correct term resistance-welding to the popular but confusing application of the term butt welding to the resistance process.

Arc welding may be described as a welding process which is in many ways similar to the oxy-acetylene process in both range and method of application, the welding heat being produced by the flame of the electric arc instead of by the combustion of gases in a specially designed torch. The temperature of the electric arc is higher than that of the gas flame, being over 6,000 degrees F., and the heat is more concentrated.

The question is often asked, "Which is the better process?" It is impossible to return a direct answer to this question. At the present stage of development it is only safe to say that some jobs can be done better by the one process and some by the other, while some can be done just as well by either. Also, each process can be used for certain applications which it is not practicable to carry out with the other.

In my opinion it is safe to say that any job that can be done by either process can be done at a much lower cost by the electric arc, especially where current is as cheap as it is in Canada. The first cost of a good direct current welder

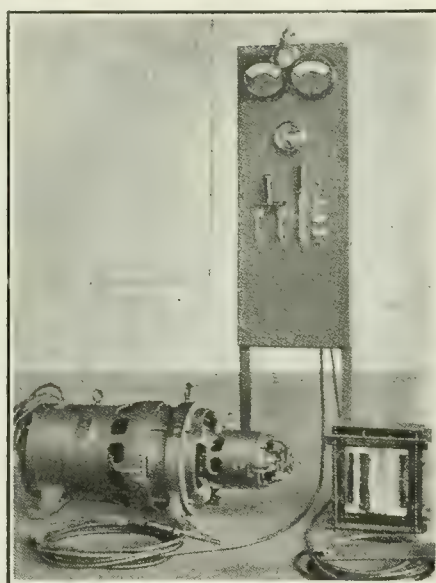


FIG. 1 LINCOLN ARC WELDER USED WHEN THE SHOP SUPPLY IS ALTERNATING CURRENT.

complete with equipment necessary for all ordinary jobs of welding, will be from \$1,200 up, which is much higher than the

cost of a gas welding outfit. The cost for current to run a 150 ampere welder, however, would be about \$10 per month in most parts of Canada, and this is the only expense apart from rent and other purely overhead expenses which are common to both systems.

There is no constant handling of gas cylinders in and out, no risk of explosion and practically none of fire. With a well-designed direct current welder there is no risk of shock, on account of the very low voltage of the welding circuit, which is usually 20-30 volts. The electric welder shown in Fig. 1 is designed for use where the power supply is alternating current. It consists of a compact, three-bearing motor-generator-set, with switchboard, stabilizer and other accessories. The motor is suitable for operation on the supply current available, and the welding current is furnished by the specially designed D.C. generator which is of the variable voltage type with separate, direct coupled exciter.

A knowledge of electricity is not necessary to the making of a good electric welder, though it is necessary to a complete grasp of the design and workings

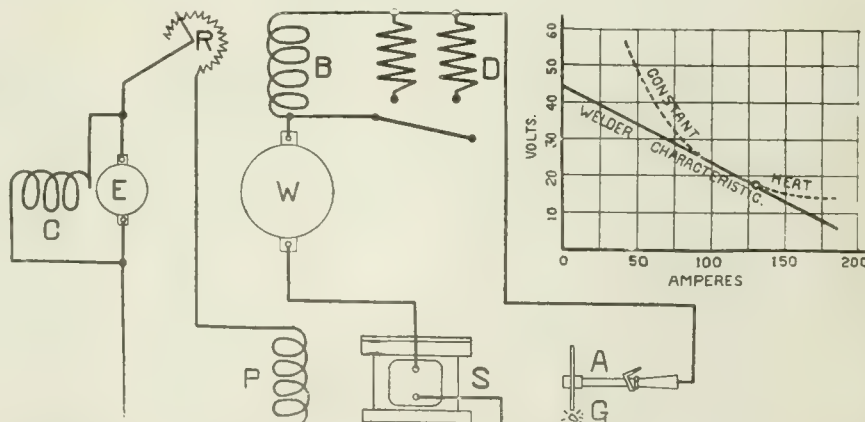


Fig. 2—Diagram of electrical connections on Lincoln Arc Welder, and volt ampere characteristic. "A" represents electrode holder; "B" series field (differential connection); "C" exciter shunt field; "D" diverter resistance; "E" exciter; "G" ground plate; "P" separately excited field; "R" rheostat; "S" stabilizer; "W" welding generator.

*The author is chief engineer for the Lincoln Electric Co., Toronto, Canada, and is an authority on the electric arc process. His chief object in preparing this material is to bring before Canadian manufacturers the possibilities of this process of welding.

of the machine. For the benefit of the man who has had electrical experience, it is sufficient to state that the welding generator is a specially designed, separately excited generator with a differential compound winding, and that an inductive ballast is used in the arc circuit.

The diagram shown at Fig. 2 depicts the volt-ampere characteristic and wiring diagram of the welding generator.

The secret of the successful application of arc welding to every-day commercial uses lies in the design of the generator. There have been many attempts to use ordinary D. C. generators for welding purposes, with but indifferent success so far as our experience goes. It is extravagant at the best, owing to the fact that more current is wasted than used, and a much higher degree of skill in the operator is necessary, as the arc is harder to hold. With a specially designed generator the arc is steady and easy to hold, commutation troubles are unknown, and the overall efficiency of the machine is very high.

The range of application of electric arc welding is very wide and constantly growing wider. In this connection it may be said that Canada is behind other countries in the use and application of the process. She is considerably behind the United States, and Great Britain is ahead of both. In England, steel structures are actually being erected in which electric welding takes the place of riveting, and, further than this, a high pressure marine boiler has been built without a rivet in it, and has now been in use for some time.

Unquestionably Canadians should wake up to the possibilities of the process. With our cheap and plentiful electric power it should have a most important bearing on the immediate future development of many branches of the engineering industries. It might even go a long way towards putting shipbuilding on a practical commercial basis in Canada. Experimental sea-going vessels have been built entirely by electric welding, at a great reduction in cost over



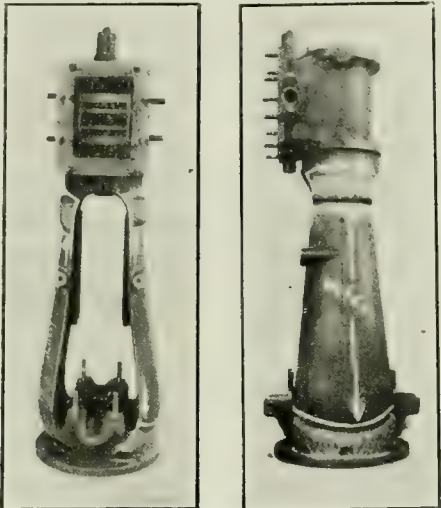
FIGS. 4 AND 5 AIR COMPRESSOR CYLINDER THAT WAS REPAIRED BY THE ELECTRIC ARC PROCESS.

riveted construction, even in England, where electric power is far from cheap.

The tanks shown in Fig. 3 illustrate this point. They are ship's fresh water

done by one man using the metal electrode process, in nineteen days of nine hours each, which is equal to an average rate of 11.7 feet per hour. The total cost of welding was 40 per cent. of the cost of riveting the same job. In this connection it may be noted that under certain conditions very much higher welding speeds may be obtained on this class of work, using a carbon electrode.

One difficulty, against which advocates of electric welding have to labor constantly, is the popular delusion that welding of any kind is essentially a process for repairing broken or defective parts. Repair work is a minor, though useful application. The big field for future development is in the application of arc welding to manufacturing processes in all branches of the iron and steel industry. The metals that are most commonly welded by the electric arc are steel, steel castings and cast iron. Malleable castings can be welded, and it is quite practicable to join malleable iron to steel. Copper can be welded to steel, and certain applications have been made in welding brass and bronze. Mild steel is probably the easiest metal to weld and the best for a beginner to start on. Any man of average intelli-



FIGS. 6 AND 7 SHOWING HOW VERTICAL ENGINE FRAME WAS REPAIRED.

tanks, irregular in shape, made of quarter-inch steel and tested to 20 pounds pressure when finished. On fourteen such tanks there was a total of 2,000 linear feet of welding. The work was

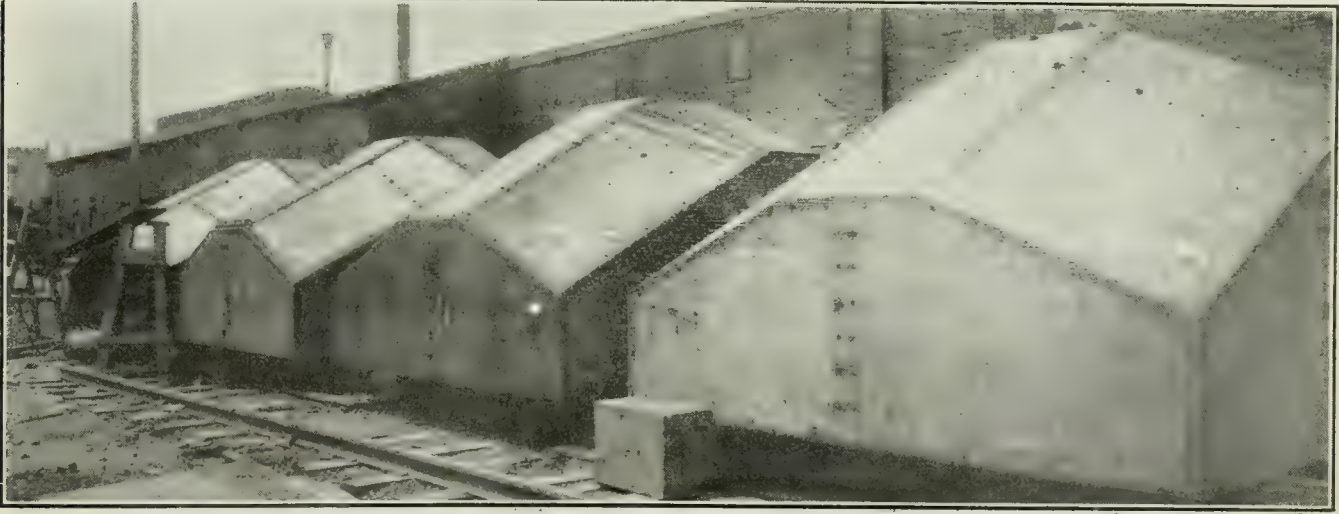


FIG. 3 THIS SHOWS SOME OF THE TANKS THAT WERE WELDED BY THE ELECTRIC ARC PROCESS.

gences can be taught to do straight-forward welding such as the construction of steel storage or low-pressure tanks, in two or three weeks. High welding speed and the ability to turn out a good smooth job come with practice. Cast steel is also easy to work. It can be welded electrically without pre-heating and with the certainty of getting a good strong weld capable of standing high pressure and tremendous bending, twisting and tensile stresses.

With regard to cast iron, it is better not to make sweeping statements. Every cast iron job is a problem by itself and must be approached as such, and with due respect for the text-books which declare that cast iron cannot be welded. Recent developments have tended to furnish grounds for some revision of the text-books in this respect.

It has been found that by using certain special electrodes, what appears to be practically perfect fusion can be obtained in a cast iron weld. It is possible to fill up a hole in an iron casting and then drill a hole, half in the original casting and half in the added metal, the line of fusion not being discernible. Such welds will also have considerable tensile strength.

When speaking of welding cast iron, we mean welding without pre-heating the castings. It is considered that experimental and research work should be conducted along these lines, because, broadly speaking, pre-heating presents so many difficulties and drawbacks that any welding process which depends on it for a reasonable measure of success is necessarily subject to serious limitations on that score. The cost of pre-heating small castings is often more than they are worth, while apparatus for heating large castings is costly and bulky. Castings of complicated pattern and thin section such as automobile cylinder blocks are frequently warped or cracked in the pre-heating or subsequent cooling process.

Small castings such as handles, levers, etc., can be electrically welded very quickly and successfully by what is

known as the carbon arc process. This consists of using a carbon pencil with which to strike the arc and holding a cast iron filler rod in the flame to melt and form the added metal. This method makes a very strong, smooth-looking weld and is strongly advocated for all such jobs.

The carbon electrode process is not suitable where consideration has to be given to expansion and contraction strains due to local heating and cooling of certain parts of a complicated casting such as a cylinder, press frame or any box section casting. These must be done by one or other of the various suitable metal electrodes or by what is known as the studding process.

The accompanying views at Fig. 4 and 5 depict an air compressor cylinder which was repaired by the studding process, and these illustrate the method more clearly than any number of descriptive paragraphs could ever do. Holes are drilled and tapped on each side of the crack, studs screwed in tight and left protruding about one-half inch from the cast iron. A metal electrode is then used to lace the studs together, the finished weld having the appearance of a rough steel plaster over the crack. As the weld cools there is usually just enough contraction to draw the crack tight. A weld made by this process is surprisingly strong. A great number have been made to the writer's knowledge on punch press frames and similar castings, subject to heavy working stresses, without a single known case of failure.

Figs. 6 and 7 show a small vertical steam engine that, to my mind, is one of the most remarkable pieces of "surgery" ever carried out by a job-welding shop. The frame of this engine was completely broken in three pieces, not merely cracked. When welded by dint of much patience and the studding process, it was perfectly true and as strong as ever!

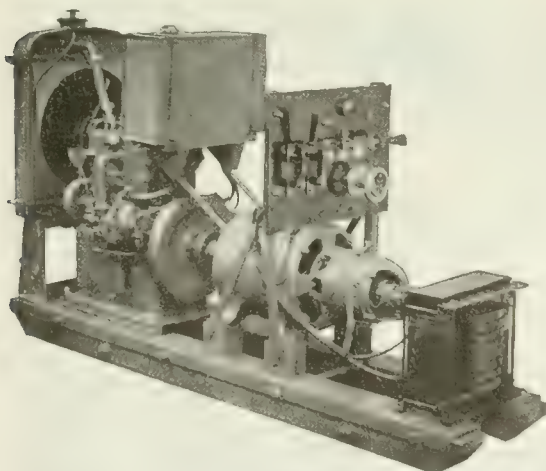
Last August the same process was used in what was probably one of the

most important marine repair jobs ever carried out on the Great Lakes. The steamer Chippewa suddenly developed a 40-inch crack in her main engine cylinder, which is 5 feet 6 inches in diameter by 11-ft. stroke. It took only twenty-six hours straight work to weld that crack up, so the well-known Niagara boat was not out of commission very long. So far as we know, the only alternative was to lay her up for the rest of the season.

Fig. 8 illustrates a piece of salvage which was well worth while. A broken tooth in this steel gear out of an English made automobile was built up by the electric arc. A special steel electrode was used to produce a hardened surface. This work can be done without softening the adjacent teeth. The replacement cost in this case would have been thirty times the actual charge made for welding.

A few weeks ago a remarkable repair job was carried out on a 1,000 k. w. motor generator set in a station of the Toronto and Niagara power company. A revolving cast steel spider about eight feet in diameter, having field coils on the periphery was found to have three adjacent spokes cracked clean through. Replacement would have cost many hundreds, possibly two or three thousand dollars, as well as tying a badly needed machine up for many weeks. The electric welder repaired the damage in two days, without removing or disturbing any part of the machine.

In an article of this nature it is, of course, only possible to give the barest outline of arc welding, its present applications and future possibilities. To the engineer who has looked into the matter to any extent, the possibilities seem unlimited. It is to be hoped sincerely that Canadian engineers and manufacturers will wake up shortly to some more of these possibilities. At present their English and American confreres and competitors are ahead of them, on arc welding at any rate!



LINCOLN ARC WELDER DRIVEN BY GASOLINE ENGINE. THIS TYPE OF WELDER CAN BE MOUNTED IN ANY STYLE DESIRED, AND CAN BE TAKEN TO WHATEVER PLACE THE WORK IS BEING DONE.

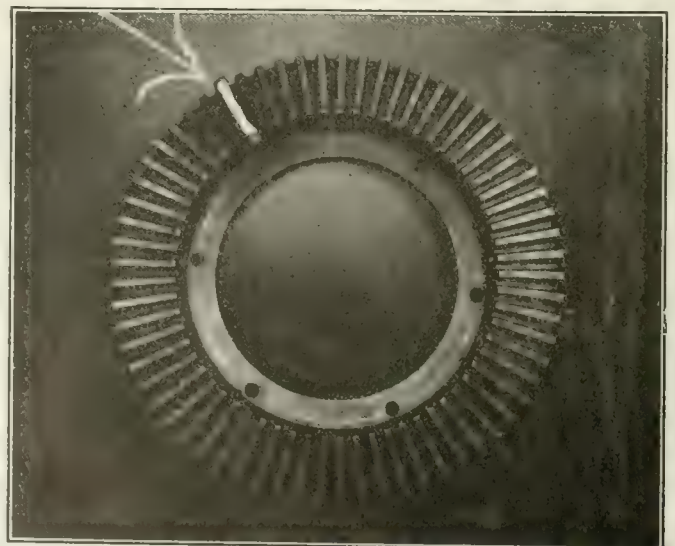
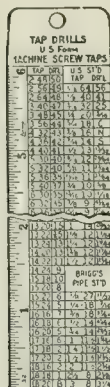


FIG. 8—THE TOOTH ON THIS GEAR WAS BUILT UP BY THE ARC WELDER USING A STEEL ELECTRODE TO PRODUCE A HARDENED SURFACE.

Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.

To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

B. Back, Hamilton, Ont., is the prize winner for April 14th contest. Chas. E. Mars, Brantford and J. A. Scarsbrook, Winnipeg, had correct lists, but lost out in the regular elimination test. One of the contestants asks this question: "Can the same advertisement be allotted to two different questions." Our answer to this is "No." We always use one question to one advertisement.

CONTEST FOR MAY 5TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

- 1—Something that is elusive
- 2—How to save fuel, increase production, and lower maintenance costs.
- 3—How to save a good deal of time and expense.
- 4—Something that arrives at the tool under 80 lbs. pressure.
- 5 A chance to do a great favor.
- 6—Something that is made at customers' specifications.
- 7—A machine that has been in operation for three years.
- 8—Something that is said to encircle the globe.
- 9—How to get your work out ahead of schedule.
- 10—Something that deserves consideration.
- 11—A certain line that differs.
- 12—A product that takes heat away from the tool.

These are Correct Answers for List from April 14th Issue:

- 1—Fairbanks-Morse Co.
- 2—John Bertram & Sons Co., Ltd.
- 3—Hendey Machine Co.
- 4—Butterfield & Co.
- 5—Crane Ltd.
- 6—John T. Hepburn, Ltd.
- 7—W. S. Rockwell Co.
- 8—Bristol Co.
- 9—Geometric Tool Co.
- 10—Nicholson File Co.
- 11—Pratt & Whitney Co.
- 12—Brown & Sharpe Co.

Closing Date for This Contest is May 26th



A.W. & Co.
 Their
 Reputation
 Encircles
 the Entire Globe

ENGINEERS' SMALL Gear Cutters Reamers

The High Speed Steel and Carbon Steels used in our tools are the result of many years of actual manufacture and careful research in our own mills. Therefore the quality is assured.

Our Name

ARMSTRONG

Works:
 Longueuil, Que.

CANADIAN

Messrs. Sir W. G. Armstrong Whitworth
 & Co., England.

Messrs. Armstrong & Main Ltd.,
 Constructional Engineers, Glasgow.

ARMSTRONG

TOOLS

Milling Cutters Drills, etc., etc.

combine scientific methods with an intimate knowledge of working conditions. Result—Accuracy and Endurance, which have machinists to insist on “A.W.” Tools.

Every Tool

HITWORTH of Canada Limited

Head Office:
8 St. James St., Montreal

Branches:
Toronto, Winnipeg

SOLE REPRESENTATIVES FOR

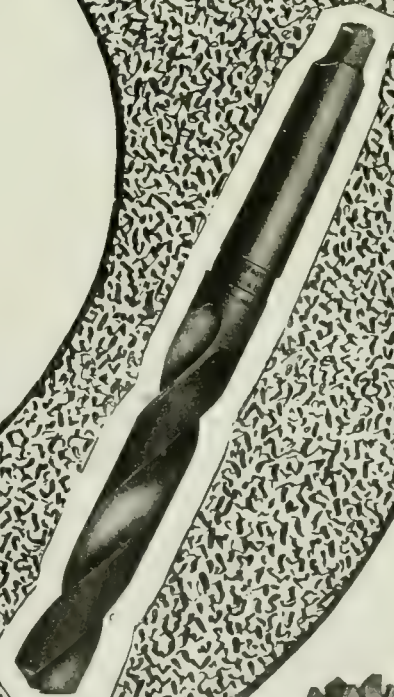
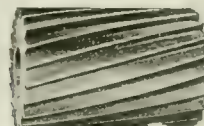
Messrs. Cromptons Ltd.,
Electrical Engineers, London.

Messrs. Armstrong Siddeley
Motor Cars, Coventry.

Messrs. Partington Iron & Steel
Works, Manchester.
Messrs. Pearson & Knowles Ltd.,
Steel & Iron Manufacturers,
Warrington.

TRADE

MARK



HITWORTH

A Heavy Duty Railroad Shaper of New Design

This Machine Uses the Draw Cut—Claims Are Made for This Principle — Details of Construction — Examples of Work Produced, and Other Features, Dealing With Points in Design

A SPECIAL heavy-duty railroad shaper has been placed on the market by the Morton Manufacturing Co., Muskegon Heights, Mich. This company has concentrated its efforts in developing the application of the "draw-cut" principle to shapers, vertical and horizontal travelling head planers and keyway cutting machines. They have made a study of the methods of production in railroad shops, and the shaper described has been developed to fill the demand for increased production of driving boxes, crown brasses, shoes and wedges, and connecting rod brasses. While we shall describe the standard style, it is to be understood that these machines can be adapted to any special requirements.

Speaking on the draw cut principle this concern make the following claims: Owing to the ram being in tension, rather than compression, the tool adjusts itself to inequalities in the surface of work as it is being drawn through, thus allowing deeper and heavier cuts to be taken. Vibration is practically eliminated, smoother work is obtainable, and special forming tools can be used to advantage. Cutting strains to the various bearings are eliminated, and tools can be used with greater clearance angles, this reducing the cutting friction, at the same time increasing the life of the tool. Shaping to lines can be easily and accurately accomplished, as the lines are always in full view and are not broken until the tool cuts them out. It is also claimed that this style shaper is a multi-duty machine, as well as a specialized railroad tool, and that the changing of machine from one class of work to another is rapidly accomplished.

Details of Construction

The column is a heavy box section casting provided with square rail bearings. All running bearings are fitted into accurately bored holes and held in position by bolts. This makes the use of dowel pins unnecessary, and maintains the alignment and rigidity of the journals. The cross-rail moves on square bearings at the front of the column. It is raised and lowered by nuts and screws and can be clamped quickly in any position. It is provided with gibs adjustable for wear. A counterbalance for the cross-rail is furnished on account of the weight of the special attachments. The saddle is fitted to square rail bearings on the cross-rail. Angular gibs provide the adjustment for wear.

The table is a rigid box section casting. Two sides are "T" slotted. The upper one forms the bolting surface for the

vise, top table and attachments. An angular extension bolts to the other "T" slotted surface to facilitate the rapid and positive binding of driving boxes when machining the shoe and wedge fit. The "T" slotted top table provides a large bolting surface for work.

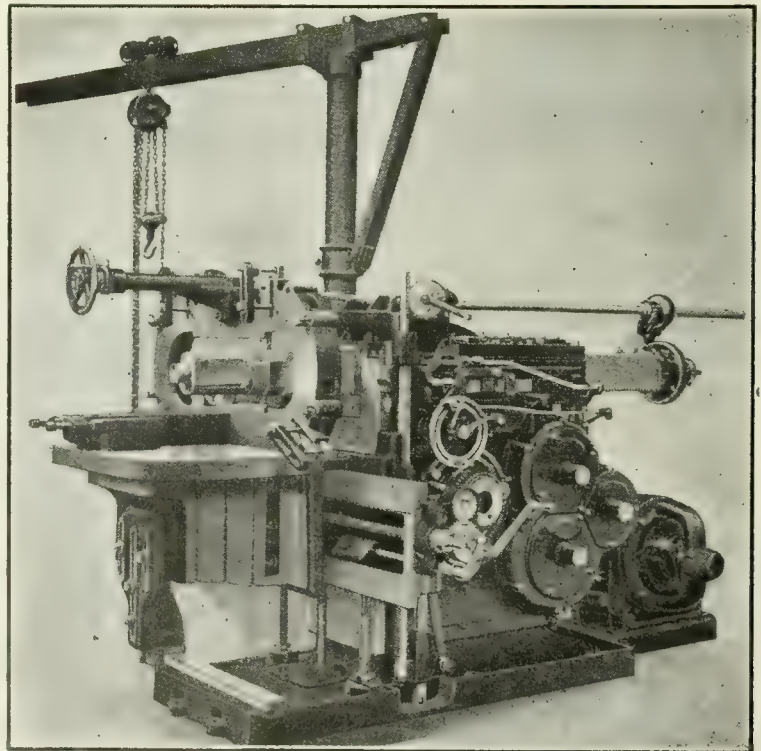
The vise is so constructed that the tendency of the work to raise or buckle when placed on parallels is largely overcome. Ordinarily the entire cutting strain is taken by the vise jaws, and excessive clamping is necessary to secure the work. The results are spring and distortion. The cutting strains in this particular machine are said to be transferred through the solid vise jaw to the back-bearing and column. Only comparatively light clamping is necessary. When planing parallel to the jaws, the adjustable backbearing forms a stop for the work. The body of the vise is of steel. The sliding jaw is of special metal with a steel facing. Two screws control its motion. The stationary jaw has parallel planed ends which can be set snugly against the adjustable backbearing, with a consequent reduction in the strains to which the vise is subjected when a cut is taken. Its base is graduated through 180 degrees.

The adjustable backbearing is mounted on a post bolted to the cross-rail. It can be moved vertically to the desired

position or swung to one side out of the way when using special attachments. It transfers the thrust of the cut directly to the column of the machine. This relieves the strains on work holding fixtures and the table bolts, lessening the danger of deforming the work by binding it too tightly. An auxiliary back-bearing is bolted to the top of the machine for transferring the thrust of the cut to the column when using the driving box attachment. It swings out of the way when not in use. The ram is steel and is cast hollow. The scale on the inner walls adds greatly to its strength and stiffness. The ram has a bearing surface on all four sides throughout the length of the column, except for a small oil space in the center, where the rack is lubricated. The rack teeth are machine cut. A bronze strip, inserted centrally in the rack, supplies a continuous bearing surface for the bottom side of ram. Wear can be taken up at the sides by adjusting taper gibs; and at the top by lowering the ram cap, which is adjustable by means of set screws. The ram is bored at each end to receive an arbor.

Other Features

The rotating arbor is a hollow steel forging. It has close fitting journals at each end and revolves in the ram, giving



GENERAL VIEW OF THE RAILROAD SHAPER.

the circular feed to the rotating head for cutting the crown fit in driving boxes. The front end is bored tapering to receive the rotary head. The shaper head is of steel, carefully fitted to the threaded end of the ram. It is graduated and can be held at any angle by a suitable clamping device. The sliding part of the head is made with the usual "V" joint, but has also adjustable side clamps with square rail bearings, which insure rigidity of the head. The swivel or tool block is threaded and fitted into the slide. It is held in position by a clamping device. The tool can be set at any desired angle. The reciprocating motion of the ram is obtained by the use of compound disc friction clutches, running inside the column in a bath of oil. Sliding collars and forged compression levers, adjustable for wear, give the necessary pressure. This design eliminates close fitting periphery surfaces which lose their size, causing trouble and necessitating new parts. The flat discs can be refilled at small expense. The material used will not injure the metallic surfaces of the clutches. A simple shifting bar and revolving cam reverse the clutches for the return stroke of the ram. The machine can be started and stopped by a clutch, independent of the driving motor. The ram may be moved as little as 1-16 inch at a time if desired.

The main driving pinion is a steel forging with teeth cut from the solid. All gearing is liberally proportioned, and the shafts are ground cylindrically true and straight. The stroke is adjusted by tappets on a circular disc, and can be changed while the machine is in operation. The adjustments are said to be so fine that the machine will take a cut and reverse close to a line. The reverse may be controlled by a lever at the will of the operator, for short stroking. A rapid power traverse for raising and lowering the cross rail and moving the saddle sideways in either direction is

provided. The feed is relieved automatically. Any horizontal or vertical feed within a wide range is obtained quickly by moving tappets on a disc. The feed screws have a coarse pitch acme thread.

Rotary feed for the arbor is obtained from the regular automatic feed by means of a gear and ratchet working in connection with a vertical rack. The rotary motion is transmitted through a spline shaft and gears to the arbor which may be fed automatically in either direction.

A splash system of oiling is used for the clutches and all shaft bearings which are subjected to heavy strains. When the machine is running, oil is pumped from a tank in the column to the ram. The belt driven machine is furnished with a two speed countershaft. Two cutting speeds are obtained by the use of an additional pulley. The countershaft furnished hangs from the ceiling. A single belt transmits the power to the machine. Motor drive for either d.c. or a.c. can be installed, but a d.c. variable speed motor with automatic push button control is recommended. A controller guard is supplied with motor driven machines. The crane and hoist are used for handling the vise, attachments, and work too heavy to be moved by hand. A two-speed chain hoist is used. The control of this machine is entirely from the right-hand side, and all levers are said to be within easy reach of the operator.

The double chuck for driving boxes, as illustrated, forms a portion of the regular equipment. It is made in the form of an angle plate, which bolts securely to the knee of the machine, and is lined at right angles to the ram. It is provided with a suitable opening for the ram and special rotating head to pass through. Adjustable stops and binders secure the various sized driving boxes to the chuck. A special rotating head for crowning driving boxes forms another part of the equipment.

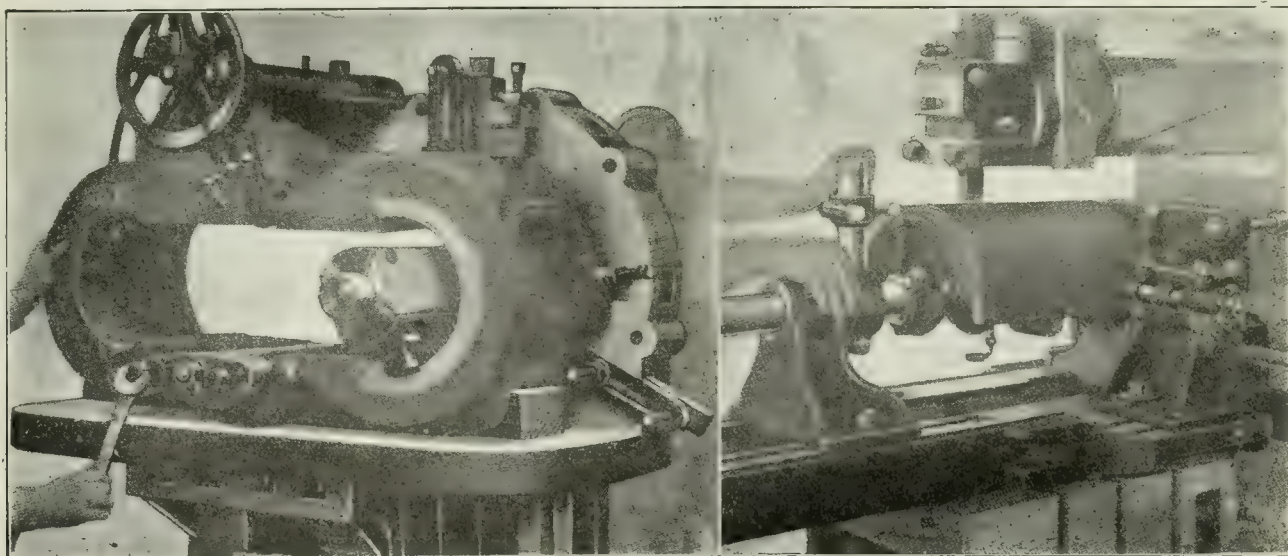
Special attachments, such as driving box shell planing attachment, shoe and wedge fixture, rod brass attachment, etc., etc., are available if required.

AN AMBULANCE AEROPLANE

The latest innovation in air craft is the "ambulance aeroplane." A British firm has completed the first machine of this type. It is an adaptation of the firm's regular commercial model for passenger service. The forward part of the fuselage is arranged to accommodate four stretcher cases as well as a doctor, nurse, pilot and mechanic. If the patients are able to sit up, eight of them can be carried. The cabin to which the stretcher cases are admitted is provided with lavatory accommodation and with special cooling arrangements for use in tropical climates. The machine can climb to 6,500 feet in ten minutes and at that height it can be driven at a speed of over 100 miles an hour. Enough oil and petrol are carried for a five hours' journey at full speed. The machine, which is fitted with wireless telegraph apparatus, will be used in operations remote from a hospital base.

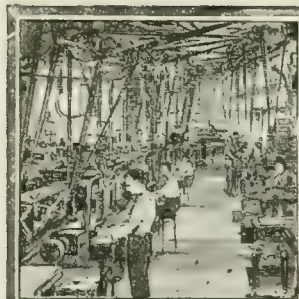
AN ADAPTABLE WRENCH

The Universal Wrench Co., Detroit, Mich., have opened a factory and office in Windsor, where they will manufacture their universal adjustable wrench. This wrench differs from the usual type of adjustable wrench by the addition of a lever mechanism which permits of pressure being applied to the jaws. A heavy duty spring opens the jaws to the determined position, when the lever is released. Among other advantages claimed is the non-slip feature—as it is said that the wrench cannot slip off the nut. It is also adaptable to smaller space as the handle need not be swung from flat to flat, but only far enough to permit the grooved jaw to grip on the nut angle. These wrenches are made of special material and are turned out in sizes from 4 to 18 inches.

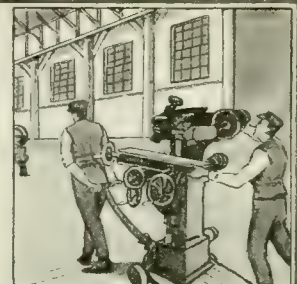


SHOWING HOW TO SET THE SECOND BOX WHILE PLANING THE FIRST ONE.

ILLUSTRATING THE USE OF THE MICROMETER SCRIBER.



DEVELOPMENTS IN SHOP EQUIPMENT



INDEX CENTRES

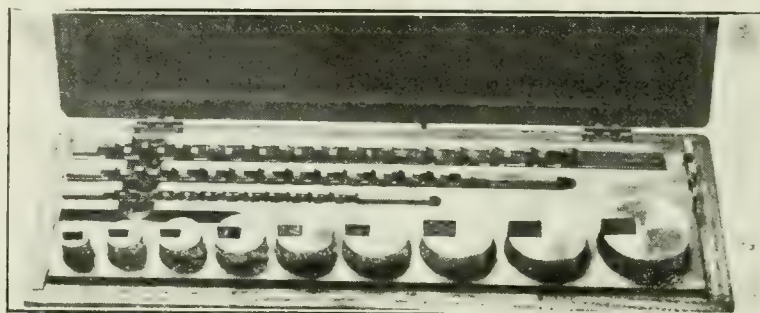
Miller and Crowningshield, Greenfield, Mass., have placed on the market a multiple-spindle index centre as shown in the illustration. These centres are designed to permit the rapid fluting and squaring of taps, reamers, etc. The device is made with one, three, four, five, six or eight spindles, all of which rotate in the same direction. The spindles are spaced closely, so that the several pieces of work will be held in as small a space as possible, and they are connected by equalizing levers that allow a variation of about $\frac{3}{16}$ inch in the length of the work being milled. The spindles have tapered holes, and a drift is furnished to interchange centres. All spindles are tightened simultaneously by operating a single handle.

Any number of flutes from one to twenty can be machined on work mounted on these centres, the proper indexing being obtainable by changing a spur gear. The indexing of all the different spindles is accomplished by turning a handle. In squaring and fluting work with only four flutes, no gearing is required, as one revolution of the index handle turns the spindles a quarter of a revolution. The tail block is separate from the head block and it is made in two styles, one solid, and the other having a separate vertical adjustment for each centre. Both types have the same interchangeable tail-centres, which can be readily replaced if they become broken or worn out.

KEYWAY SET

The Velco Mfg. Co., Inc., Greenfield, Mass., have placed on the market a broach keyway set as shown. These broaches are equipped with patented

keyways in work up to $1\frac{1}{8}$ inches long, 3-16-inch keyways up to $1\frac{1}{2}$ inches long and $\frac{1}{8}$ -inch keyways up to $1\frac{1}{4}$ inches long. Bushings from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches are included.



VIEW SHOWING THE KEYWAY SET.

staggered tooth cutter bars, and are said to cut smooth finished keyways with the use of the ordinary arbor press. The idea is this:

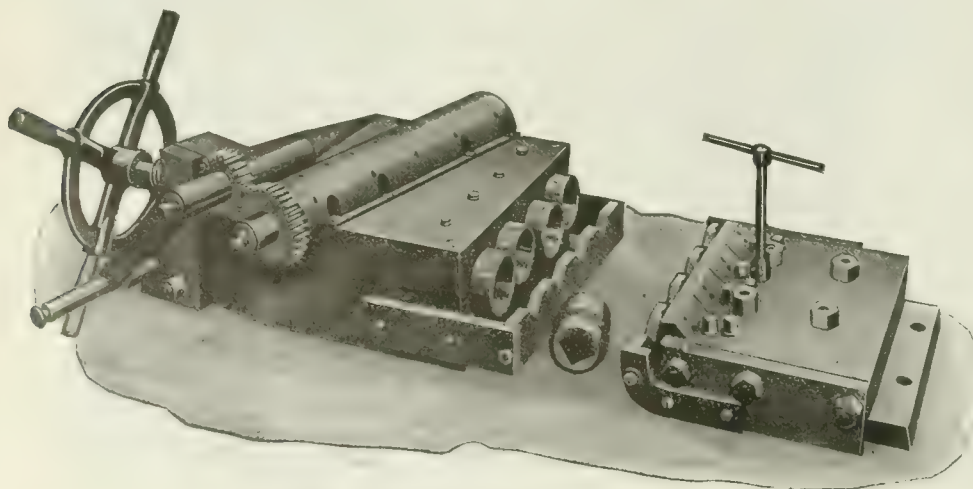
The work is slipped on to an accurately sized bushing, the tool steel cutter is inserted, the work is placed under an arbor press, and the tool is pressed through similar to any ordinary arbor. Should more than one keyway be desired in the same piece, the work is turned around to the required angle and the operation repeated.

The set is said to be particularly useful when cutting keyways in pulley hubs, couplings, milling cutters, etc., and where necessary half-round special broaches can be made. The complete set weighs only seven pounds and will cut $\frac{1}{4}$ -inch

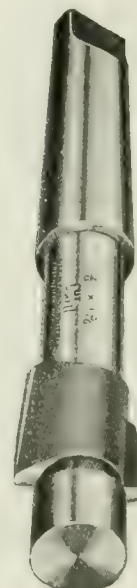
TWO LIP COUNTERBORE

The Bickford-Switzer Co., Greenfield, Mass., have placed on the market a counterbore of new design. This is shown in the illustration. This tool has been designed for counterboring on a production basis, and has two lips. It is said to have ample clearance, and with the spiral flutes will cut faster and even longer than the regular style counterbore.

Chattering is said to be eliminated, and special provision has been made for sharpening. The body is circular between the cutters, in this way maintaining a pilot until the tool is worn out.



MULTIPLE SPINDLE INDEX CENTERS.



TWO-LIP COUNTERBORE.

SELF-LOADING WAREHOUSE TRUCK

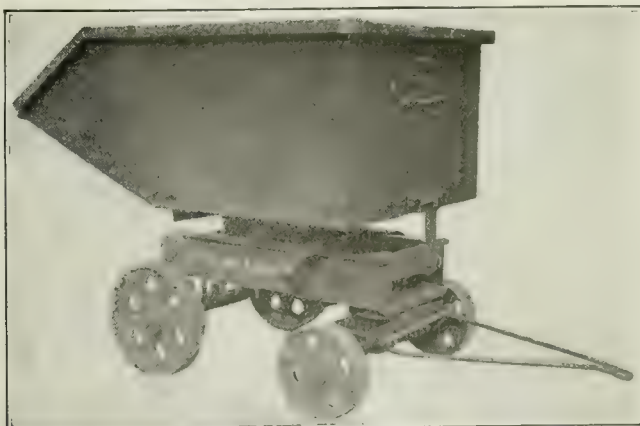
The Lewis-Shapard Co., of Boston, Mass., are now making a self-loading warehouse truck, built in two sizes, one having a capacity of 800 pounds, and the other capable of handling a load of 1,200 pounds. The truck is of all metal construction and fitted with Hyatt roller bearings. The grab hook may be placed in 38 different positions, 10 vertically and 28 horizontally. The respective weights are 72 and 76 pounds.

MOTOR DRIVE FOR MILLING MACHINES

The Clark-Mesker Co., of Cleveland, Ohio, is now making a special bracket for attachment to the Cleveland milling machines for direct motor drive. Provision is made for a friction clutch between the lower sprocket and the main drive shaft. This drive may be fitted to existing belt driven machines by simply bolting the bracket to the column in place of the single-pulley belt-drive housing. The motor speed is approximately 1,200 r.p.m. and drive from the motor to the machine shaft is by means of a Morse chain.

NEW SCOOP CAR TRAILER

A new scoop car trailer which is equipped with flat tread, instead of narrow gage track wheels, and which it is said can be pulled around anywhere and is easily handled by one man, is being offered to the trade by the Easton Car & Construction Co., 50 Church Street, New York. It is designed for a variety of work ranging from the handling of steel chips, small forgings and castings, and other material in machine shops, to the handling of coal, coke and cinders in and around boiler houses and foundries. Its capacity is 27 cubic feet and it is built low to facilitate hand loading. The body is mounted on a structural turntable and can be turned around in any direction and dumped from any one of the four sides. The front axle is of the swivel type, equipped with a machined cast-iron ball-bearing turntable, permitting the car to be turned in practically its own length. The wheels are of the roller-in-the-hub type. A study of the



THIS SHOWS THE SCOOP CAR TRAILER.

LEADING ARTICLES IN THIS ISSUE

Surface Grinding 700 Ball Races Per Hour 65

Grinding Steel Forgings—Gear Blanks—Cylinder Castings—Locomotive Crank Pin Washers—Dies—Push Rods—Gear Boxes—Connecting Rods—Brackets, and Steady Rest Jaws.

A Problem in Sheet Metal Work 71

The Development of Funnel and Spout—This Panel Shows the Elevation, and the Developed Patterns. Method of Drawing is Shown. Also Allowance to Make For Wiring and Seaming.

Manufacturing Lightning Mixer and Beater 72

Various Dies Used in Producing, These Including Blanking and Forming, Depressing and Trimming. Also Piercing and Marking—A Crude Yet Effective Twisting Fixture is Also Shown.

Grinding Locomotive Guide Bars 74

Special Jug Used For the Purpose—This Section Also Describes Method of Grinding Automobile Gears—How to Force Home a Piston Head, and a Method of Cleaning Burrs From Threads.

Welding Irregularly Shaped Water Tanks 76

Describing Range and Application of Electric Arc Welding — Repairing Air Compressor Cylinder by Studding Process—Welding Small Vertical Engine Frame, and Building Up a Broken Tooth in a Steel Gear.

Canadian Machinery Weekly Contest 79

Interest in This Contest Still Continues to Grow—Have You Tried It So Far? If Not, Have a Go at It—You'll Find It Interesting and Instructive—On Top of That We Give a Scale Each Week to the Reader Sending in a Correct List of Answers.

Developments in New Equipment 82

Multiple Spindle Index Centers—Keyway Set—Two-lip Counterbore—Scoop Car Trailer—Pattern Milling Machine—Self-loading Truck.

illustration herewith will allow readers to form a general mind picture of this trailer.

ROTARY-TABLE FOR MILLING MACHINES

The Cleveland milling machines can now be fitted with rotary tables made by the Clark-Mesker Co., of Cleveland. A table is made for each size of milling machine. When power feed is used, sixteen changes are possible, and these are controlled by the same lever that operated the feeds for the sliding table. Telescopic sleeves connect the worm shaft, the worm running in oil. The worm wheel below the table is of large diameter. The table rests in taper bearings and an automatic trip is provided

for release at any desired point. By using a crank and index plate the attachment can be adapted to the cutting of large gears.

PATTERN MILLING MACHINE

The Oliver Machinery Co., Grand Rapids, Mich., have placed on the market a pattern milling machine known as the Oliver No. 75. This machine has been used for some time with success in milling wood patterns, but the illustration shown is that of milling an aluminum pattern. Soft metal patterns of any description can be milled, and we have information to the effect that a very high percentage of saving was obtained in one pattern works alone through the use of this machine.



VIEW OF PATTERN MILLING MACHINE.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

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Business Papers at Washington

SECRETARY of Commerce Hon. Herbert Hoover has arranged to meet with business paper editors at Washington at regular intervals for the purpose of discussing in what way these papers can best serve the interests of the nation.

Mr. Hoover recognizes that these papers have a real field and that they are performing a real service. It is the part of good politics for him to take advantage of their columns.

The plan of meeting with these editors gives the latter a new and vital interest in affairs at Washington and they are far more likely to give intelligent assistance to a government department that is ready to meet with them and give them the facts than with one that leaves them to dig for what they can find.

The fact that Hon. Herbert Hoover considers it worth while to confer with business paper editors shows the standing the business press has attained in United States.

When the Secretary of Commerce at Washington links up with the 500 business papers of the States and through them gets to the millions of people that these papers reach in the business world, he has placed his department in line with a force that is going to be of real assistance to him.

There's a Real Point Here

MANUFACTURERS in general are faced with the problem of keeping their establishments going and making the best showing possible in a period such as we are going through. There are plenty to give advice, but much of it is not practicable because it comes from men who have no intimate, everyday connection with the machine shop, the foundry or the office.

A Toronto manufacturer made a worth while point in discussing this matter with Canadian Machinery a few days ago.

"There are many things people can do in going through a period such as we have been in for the past six months, but the trouble is that the plan I may try at my shop may not be much use any place else.

"But remember this, there are certain foundations that one can never allow to be broken down. These must be kept up if you are going to stay in business at all. There is the danger of cutting your business movement too fine. There is the danger of cutting the wages of your men, particularly your foremen and superintendents to the point where it takes the conceit and the pride out of them. When this is reached it is better to turn the key in the door and quit until things turn for the better.

"It is possible to run your business like a man trying to save fuel in his boiler. He starts to bank the fires and he

starts to use clinkers instead of good coal. After a time he finds there is a call for steam some day and he is not able to produce it because his fire has gone too low. That may be a homely way of stating the case, but it has the real point, viz., that there are well-defined limits in the way of curtailment and it is not safe to go beyond them."

This same warning is capable of very general application. Some firms find it necessary to curtail their publicity. Quite right. Others cut it to the point where they are banking the fires where they are depending on the clinkers of past services and connections to keep up the fires of business accounts.

Some day there is going to be a call for real, live steam—for action, and the firm that is ready is going to move out in advance, while others are shovelling out ashes and clinkers and tearing down the banking they have put on their fires.

None Working—No Strike

ONE of the most remarkable statements made in connection with the May Day strikes, or rather the lack of them, was by one union official who stated that owing to the large number of their men who were out of work there would be no strike.

In other words, had things been going on as usual and had their members been making a decent living, instead of nothing at all, they would have staged a strike.

But now that they had very few members at work, the strike had been passed up for this year.

It would seem, then, that the proper way to avoid strikes is to have plenty of unemployment.

Canadian Trade Worth While

The New York Herald says editorially: "Deflation and its consequent check on international commerce have placed in bold relief no more satisfying development than the consistent growth and stability of the Dominion of Canada's foreign trade. Especially gratifying has been the steady enlargement, through prosperity and adversity, of the commercial and also the purely financial relations between the Dominion and the United States. Not only does this country occupy first place in Canadian trade, but our money investments in Canada far exceed what might have been anticipated only a short while ago.

"Here is consistency in trade which it would be hard to surpass. Canada's trade strategy has been that of her tutor, England. With three-fourths of her territory still to be developed, her commercial wisdom already has built for her an enviable place in the commerce of the world.

"Ill-conceived restrictions may deflect the currents and benefits of her commerce, but she has hit her stride in the path of progress and there will be no stopping her. Canadian trade with the United States is of the kind that will repay the most sympathetic and intensive cultivation."

WE ARE NOT TURNING OUT APPRENTICES NOW

F. W. Bawden Believes That as a Result There Is a
Better Opening Now Than Ever Before

"I venture to say you can put on the fingers of your hand the number of apprentices to the machine shop or iron molding shops that have been finished in the past year." That is the estimate that F. M. Bawden, of the Bawden Machinery Co., Toronto, puts on the present apprenticeship system.

"I can't see any way out until we get a class of boys who will take some interest in their work. It seems to be little use trying to get manufacturers to stop stealing boys from each other. The very fact that so few boys are going all the way through these two trades, the machine shop and the iron foundry, makes it all the more desirable that there should be some to make the start, for there are good openings for the men who finish thoroughly.

"The production methods of some of the shops make it very easy for them to take a boy who has had a year or two good training and give him a figure to do production work that makes the boy dizzy. I can recall being in one of the American centres about a year or so ago, when they had such a demand for production in the automobile shops. Several boys were apprentices in a shop where they build a very fine line of machine tools. These chaps, as lathe hands, were good and their general knowledge, as far as they had gone, was excellent. They were on the way to turning out to be good foremen or superintendents. The automobile shop had men on the lookout for just such boys and they baited them with wages of \$6 a day, which, of course, looked a whole lot to the boys who were then making about \$7 per week. Most of those who were approached in this way fell for the big money and as mechanics they stopped right there and then. They went in as production men in the auto shop and as long as things were going well they made the better money, but they ceased to develop. The man who took those lads out of the shop where they were learning to be real machine tool builders, and perhaps later designers, did them a mighty poor turn.

"We are not turning out mechanics in Canada, neither are they coming to us from other countries," continued Mr. Bawden. "As I said before, the molding shops are not getting them, neither are the machine shops. We need boys who at sixteen are neither cigarette fiends nor running around at nights. Out of these chaps we can make mechanics. I would almost venture to say that as a result of the system, or the lack of it, in regard to apprentices, we will be paying more eighteen months from now for machinists and molders than we were during the years of the war. If there is any other way out I can't see it."

Using the Booster Engine

DESPATCHES from Kingston, Ont., state that several locomotives being completed by the Canadian Locomotive Co. are fitted with the booster engine, the first to be used on Canadian-made engines.

The auxiliary tractor idea is not a new one, although as it stands at present it is a great improvement over the first attempts in this direction.

It is in reality a small engine, two-cylinder, geared to the trailer axle of the locomotive. Steam is furnished direct from the boiler. The advantage is in starting from points at rest, or in furnishing additional power on grades. When the load can be just as well handled by the locomotive, then the booster is shut off.

Tests made out of Kingston on a trial run were apparently quite satisfactory and the little auxiliary power plant responded

splendidly when the call was made for more power. A number of other engines that are being built at Kingston now are having the same device attached.

When the idea was first covered by patents as far back as 1889, the idea apparently was to have these auxiliaries attached to several cars, as the wording of the patent says:

"The equipment being such as described, it will be seen that each motor will receive live steam from the boiler independently, and will exert its power upon the particular car to which it is attached. If each motor, for example, be of six horse, a one hundred horse power boiler will supply eighteen motors and propel a train of that number of loaded cars up heavy grades with ease and speed."

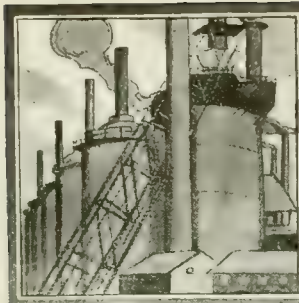
It is not known if that idea was ever put into practical use. The difficulties of supplying steam to a string of cars for the purposes of driving various engines are apparent and the upkeep of these numerous small engines would be no small consideration.

A writer in a technical paper, after reviewing the uses of the various types, sums up by saying that (first), that an appliance whereby a temporary increase of the tractive power of a locomotive may be afforded will be found to be of substantial practical value; (second), that the weight and cost of construction and maintenance of such an appliance should be reduced to the minimum; and, (third), that its design should not contemplate increased power for hauling tonnage after the locomotive has got the train in motion, but should be confined to means for enabling the engine to start the maximum tonnage that it is adapted to handle, from points of rest at which the train could only be started by backing up to more favorable position for a start.

Some idea of the force of the explosion of a flywheel is furnished from an incident in Richmond, Kentucky. A flywheel burst at the plant of the Utilities Company. Wrecking the engine beyond hope of repair, part of the wheel ripped through the roof and buried itself in the ground half a mile away. In its flight it crashed through a house, entering by the roof, passing through and leaving by the side. As it did so it struck and instantly killed a child and injured a young woman. Investigation has given no cause or reason for the explosion.



We can't travel with one wheel on the high road and one on the low road.



MARKET DEVELOPMENTS



Prices Seem Steady at Present in all the Markets

Effect of Pittsburgh Price Seems to Have Done Away With Much Of the Price Cutting—Passing of May Day Helps to Remove Cause of More Trouble—U. S. Export Trade Falls Off

MARKET conditions are not undergoing any marked changes, either in iron, steel or machine tools. Managers of many warehouses are kept in an anxious state of mind between reducing stocks in order to clear out high-priced material, and, on the other hand, keeping the stock sufficiently well assorted to give the service to the customers that they must give in order to hold their place in the trade.

Manufacturers in the iron and steel lines are in the same position. They must, of necessity, cut their overhead severely and at the same time keep up the nucleus of an efficient and effective organization for the time when the turn in business comes.

Most of the buyers of iron and steel seem satisfied that the present quotations on these lines are reasonable and should be the ruling figures of the market for some time to come. But that is not causing an increase of buying to any marked extent and the dealers state very frankly that they do not expect

this increase until the buyers find it necessary to buy for some definite manufacturing programme.

But there are some concerns that report business as being very fair. They are securing some satisfactory orders and although the volume is not as great as a year ago by any means, they are satisfied with their progress.

Prices remain much the same in the steel trade locally and it is hardly to be expected that there will be changes for some time. There are variations in prices, but these come from dealers who still house more high-priced stock than they care to swing and they are letting certain tonnages pass out at a favorable figure to the buyer.

The scrap metal markets show no change. Dealers could probably secure contracts at to-day's figures, but they will not take them as they know it would be very difficult for them to go out and buy the material necessary to fill them at to-day's prices. Those having scrap prefer to hold it than sacrifice at the figures of this market.

MONTREAL WAREHOUSES NAME NEW PRICES ON BAR MILL MATERIALS

Special to CANADIAN MACHINERY

MONTREAL, May 5.—May-day has come and gone and with it some of the nervousness that featured business a week or so ago seems to have disappeared, although industry is still disturbed by the rumblings of wage and working agreements. It does not seem that the metal working trades will be seriously affected in this respect, as those chiefly concerned are the building and the printing trades. It is even thought that early and satisfactory adjustments will be made in industries affected. Business activity in this district shows gradual but slight improvement, even though some reports indicate marked depression. Others reflect better business, so that on the whole there is a feeling that a slow return to normal is taking place.

Bar Base Quotations Lower

While the steel situation here has become steadier as a result of the recent stabilization of prices in the States the market cannot be said to be one where a definite price prevails throughout all

quarters of the trade. The liquidation of stocks is still going on and quotations fluctuate with the nature of the order and the needs of the customer. Orders range from tons to small parcels in pound weights of less than two figures. Despite the realization that steel prices are likely to remain quite firm for some time there has been little evidence of active buying on the part of many consumers, and the situation has changed but little from that of the past couple of months. It is thought by dealers here that no pronounced change in attitude will be shown until more settled conditions obtain in regard to railroad affairs. There has been a revision in local steel quotations, the base on bars being now \$3.75 per hundred lbs. Quotations on chequered floor plates are now 6 cents per lb. Better movement for tubes and sheets is reported for last week.

Buying Still Limited

Users of machine tools are still refraining from placing orders for equipment other than that required for im-

mediate needs. The general situation has not improved sufficiently to warrant the expenditure necessary in acquiring machinery that would only be used in busy times, and this still seems to be an unknown quantity and one that will only be used in solving the problem of the future. The question of the present is one of keeping down the overhead, and doing with what you have got is one way out of the difficulty. This is evidently the attitude of the majority of the consumers, and the reaction on general business is that of retarding production, and consequently delaying the time when normal business will be the order of the day. It is often found that in order to make a sale the dealer or the salesman will require to meet the purchaser in the matter of price, as only in this way will the user be persuaded to buy. This condition is particularly pronounced in the acquisition of supplies, as it is these lines that the consumer must have, and yet has the choice of selecting from a great number of dealers, or calling salesmen, and in a measure, getting each seller to compete against the other for business. It is doubtless true that the prices ruling to-day are the lowest that could possibly obtain under the existing conditions of manufacture, where very

often the cost of production is on a par with the prices received for the goods.

Scrap Still Stagnant

"There is nothing to indicate that industrial activity is on the increase, as business in general continues more or less quiet. Past experience has shown us that the forerunner of active times, invariably, is noticeable in the old material yards before any appreciable improvement is visible in other directions. This is caused by the period of preparation usually necessary in getting back to busier times, when plants and factories are laying in a stock of raw materials for manufacturing purposes. The demand for all grades of scrap is very light and prices (though firm as quotations) are subject to change with the conditions under which the sale is made." This statement by an old material dealer reflects the continued dullness prevailing in scrap circles, and the consensus of opinion seems to justify the claim that the summer will be well spent before active operations will be resumed.

LITTLE CHANGE IN TORONTO DISTRICT

Market Conditions Remain Much the Same—Buying Being Done in Small Quantities

TORONTO.—Market conditions in this district remain spotty. Were a person to make one or two calls, and if these calls happened to be on the ultra-conservative class, the conclusion might easily be formed that there was no business moving at all. On the other hand by the time one has gone over a dozen or so places in the machine tool, steel and iron market, it is found that although the general business moving is small in volume there are several bright spots where firms are getting a fair amount of orders. In the latter class, when the previous months and general conditions are considered, there is a marked tendency to state openly that business is improving, and that they have no reason to complain.

Various guesses are put out for the holding up of orders during the last couple of weeks, when it has been quite noticeable. One is that the payment of the income tax has taken up a lot of money, and has also had the effect of making people hang on tighter to what they have. Another is the amount of money that is being put into the stocking up of cellars against the last day of importation. There is no doubt considerable reason for the advancing of both reasons.

Orders Are Not Placed

Almost any dealer can show you a fair list of prospects, and from a number of these he is quite certain that he is going to secure orders. For the present, though, the orders are not being placed, and dealers who are specializing

POINTS IN WEEK'S MARKETING NOTES

Pittsburgh says that some of the mills are now running around 40 per cent. The new price list of the Corporation caused quite a tonnage to be released.

U.S. export trade in machine tools has fallen off sharply. They are meeting very sharp competition from other countries.

May Day passed with few strikes in the metal working industries. Leaders say it is due to the amount of unemployment in these lines.

Montreal warehouses have named a price of 3.75 on bar iron and steel.

Structural steel should be moving much better were there going to be an improvement in building operations.

The scrap market is still very much down. Dealers could probably make contracts at present prices but it would be difficult to get the material with which to fill these contracts.

on a few lines are having it harder than firms that are carrying a more varied line. April has not been a good month for most of the firms, although some of them could not state definitely how it compared with other months this year and last. The month in a number of cases seemed to start out very well, but before it had gone half way there was another slowing down, which tended to spoil the totals for the whole period.

Stocks Getting Low

Evidence that the policy of getting stock down to the minimum is having its effect is found in several places. For some time some of the firms handling a large number of lines have been selling out as though they had no thought of continuing in business. Ordering has been done direct to the factories just as requirements made it necessary, and there has been a decided departure from the old idea of the well-assorted stockrooms. There are cases coming to notice where stocks are not kept up well enough to cater to trade that comes into the market quickly and that wants immediate service. One dealer instanced this week a case where there were twenty-two of a certain article wanted, and he could supply only eight. He did not get the order for the eight because the purchaser found some other place where he could place his whole order in the one lot.

"It requires a lot of study to avoid just such a happening as that," commented the dealer. "We want to get our stock down to the bone, and yet once we get it down in that direction we run into the danger of not being able to look after our customers. Once the trade gets the idea that your stock is shot to pieces you have lost ground that is going to take hard work to regain in the future. There are two options, keeping stock up and taking your losses as goods are marked down, or getting rid of your stock and protecting yourself against a loss in that way, and at the same time losing a certain amount of business through not having enough stock on hand. It requires a fairly good lot of serious thought to frame a policy that can be followed successfully now. It looks to me as though any policy and any staff should be more versatile now than at any time in the past."

Steel Market Quiet

Prices have not been changed during the week on lines in the steel market, and the trade generally considers that the prices now named as the standards of the market will probably be continued for some time. This has not encouraged buying to any extent, although it was hardly to be expected that there should be an immediate response to the new price list.

Here is an opinion of one of the dealers in steel: "There have been a number of statements given out that the new price in steel is likely to have a very good effect on the situation. As a matter of fact many of the men who give opinions are not rendering a good service because they always try to throw some undue optimism in the future. I believe all this had the effect of keeping labor prices up. When the men in the shops or in the offices see what some of the leaders have been saying they get a false idea of their own position or of the importance of the work they are doing. I know of one case that actually occurred, where the manager of a firm that was running four days a week in order to keep the men employed over the winter gave out one of those 'going-to-be-all-right' interviews. The men in the shop and in the office at once got the idea that things were going to break all right, and the idea spread that the putting of the works on four days a week was nothing short of an injustice and an imposition on them. I think we have got to get down to production on a lower and a better basis. Labor costs must come down or I cannot see how building is going to go ahead. The steel market will recover when the labor market gets down to brass tacks, and not before," was his concluding remark.

The Scrap Metal Market

The waste material markets in Canada have been sluggish, demand from consumers showing no quickening. Hand-to-mouth purchasing by manufacturers

has been all that has been done, and most waste material dealers do not look for any immediate improvement in the situation. Most guesses are that it will be yet a month before industry in general will begin to move at a normal pace. Signs of expansion in operations have not been lacking, but most manufacturers seem to be using up such raw material as they have on hand.

In scrap iron and steel Toronto dealers report no change. The tendency of prices has been easy despite the better outlook resulting from the disposition of steel products prices to stabilize around the new levels announced recently by the

United States Steel Corporation. Excepting in scrap, few transactions have been reported. Most holders of scrap are waiting for higher prices on open-hearth and rolling mill scrap, and not pressing for business.

The consumption of metal products in the Dominion and in the States is reported to be steadily expanding, but scrap dealers in Toronto have not done any business to speak of. Small lots of scrap grades have been called for. Prices are rather firm at last quoted levels. Generally dealers state they are not being offered much scrap and that their supplies are relatively light.

PITTSBURGH STEEL MARKET IS BOTH STEADY AND VERY QUIET NOW

Special to CANADIAN MACHINERY

PITTSBURGH, May 5.—The steel market situation might be summed up very briefly by saying that the market is very steady and also extremely quiet. As to steadiness, the prices recently developed are being strictly maintained, and while in pre-war times that was not an unusual but rather the usual condition, it has not been so usual since the war, since for two-thirds or three-fourths of the time the independent and Steel Corporation prices have been different, the independents being usually either above or below the Corporation. That is the better way to put it, rather than to say that the Steel Corporation has been above or below the independent prices, since it is the independent prices that have done nearly all the fluctuating.

Already there is some speculation in trade circles as to whether or not the independents will cut the prices they have lately adopted. Just now the various producers strongly assert that they will not, because they cannot afford to, but it was only last November they stopped saying they could not sell at the Industrial Board prices, while about the beginning of February they began to cut those prices. The unit cost of production is very high, on account of poor distribution of overhead with the present light operations, but an individual mill might figure that if it secured additional business, furnishing a more economical operation, it could thus afford to sell at a lower price. As to the Steel Corporation making any further reductions, the Steel Corporation's general policy is well understood. The Corporation would reduce its prices if thereby a broader consuming market for steel could be developed, but it is plain that this could not be done at present or in the near future. There is a very strong probability that steel prices will be reduced readily when a latent demand develops large enough to give the steel industry reasonably full employment, but no one expects such a condition to develop in the near future. There are possibilities of it for next September or

October, but the common view in the steel trade is that there will be no really heavy demand before next year. A heavy demand would be a demand more than 50 per cent. greater than the present demand, which is running, at long range view, at about 40 per cent. of capacity.

Quiet Market

The Steel Corporation is undoubtedly receiving more business than formerly, or since it reduced its prices, this carrying with it a modification of contracts. The Corporation's customers are naturally more disposed to specify now than a few weeks ago, when the cost was higher than prices that could be done with independents. However, the increase in the Steel Corporation's specifications is perhaps not altogether as great as might have been expected to result from the change in prices.

This Steel Corporation business, however, does not appear in the open market, being simply in the form of specifications against old contracts. In the open market there is very little business. No new or increased wants have arisen, and the volume of business being booked by independents is particularly small now, as is naturally to be expected from the circumstance that customers of independents closed rather freely at the time when the independents were withdrawing their former quotations in favor of the advanced prices they are now adhering to, and to which the Steel Corporation reduced.

Steel Prices

The following quotations, developed in the readjustment that fell approximately within the period April 8 to April 15 still rule: Billets, \$37; slabs, \$38; sheet bars and small billets, \$39; rods, \$48; bars, 2.10c; shapes, 2.20c; plates, 2.20c; hoops and hot rolled strip, 2.75c; cold rolled strip, 5.50c; plain wire, 3c; wire nails, \$3.25; standard steel pipe, 62½ per cent. basing discount; blue annealed sheets, 3.10c; black sheets, 4c; galvanized sheets, 5c; tin plate, \$6.25.

In manufactured steel products there

were some changes in the past week. At first, in the readjustment, some spike makers, as noted in last week's report, set standard spikes at 3.30c, small spikes at higher base prices and boat and barge spikes at 3.85c. Then the Illinois Steel Co. and Inland Steel Co. put out a uniform base price of 3.40c applicable to all spikes, subject to extras in the list used during the war control, and the other spike makers are disposed to use this price basis when in competition, but some of them assert that they will not do it regularly.

Last week's quotation on chain, 6.35c, was based on the quotation of one producer, who had reduced from 6.75c. The other producers have since reduced from 6.75c to 6.25c, base, at the same time decreasing the advances on ½-inch and smaller by a quarter cent.

Operations

The Steel Corporation has probably a slightly heavier operation now than at its low point about three weeks ago, when the rate was scarcely 40 per cent. of capacity. The independents are doing better, probably operating at 40 per cent. or more. In January the Steel Corporation operated at about 90 per cent. and the independents at about 30 per cent.

Pig Iron and Coke

Foundry iron is easier. While some producers are still quoting \$25, valley, and state they are picking up small orders from regular customers, one producer has gone to \$24.50 and it is possible \$24 might be done, the price at any rate being quoted by some middlemen, perhaps on resale iron.

Merchant furnaces that were holding basic iron at \$25 have withdrawn the figure and have no open quotation. When any worth while inquiry develops they will decide what to quote. A steel works interest that sold over a month ago at \$23 has gone up to \$25. Lower sellers remain, and the question just now is whether they will develop enough competition with each other to do \$22 or less, or will withdraw on account of other producers having gone up, and with the idea of giving the steel market some sentimental support. One valley steel interest has sold several small lots of basic iron at intervals at \$22.50, while a Canton interest states it was quoted as low as \$22 on its recent inquiry for 10,000 tons for May. No purchase was made as the company will blow in its own furnace instead, probably because it has a by-product coke plant that would make the operation more economical than that of a furnace selling pig iron at \$22 and buying Connellsville coke. The question is whether the \$22 quotation made for Canton was from Weirton, valley or Cleveland, as the three points have the same freight to Canton, \$1.96.

Connellsville furnace coke shows quite a range. Sales three weeks ago were at \$3.50, while since then coke has sold both lower and higher, at \$3.25 or \$3.30 and at \$3.75, possibly at \$3.90. It is

unusual for there to be such a spread. Some furnaces believe they could buy at \$3 if they could offer a good tonnage, sufficient to operate a coke plant economically. As it is, most coke producers keep their plants idle as there is less loss in that than in running to produce the very small quantities for which orders could be secured. Spot foundry coke remains at \$5 to \$5.50.

NEW YORK SEES NO IMPROVEMENT

**Booking Going to the Mills Is Small—
Bidding Hard to Secure Export
Business**

Special to CANADIAN MACHINERY

NEW YORK, May 4.—Despite the fact that machine tool business is showing no improvement, prospects continue to multiply, indications that some buying may be done when the psychological time for business resumption has arrived. Undoubtedly there is an improvement in the general situation, but it is extremely slow and there is nothing in sight yet to indicate the speedy revival that has frequently followed business depressions of the past.

Much of the business in machine tools now being talked of is for export. The Japanese Government has a list of machines on which it is getting bids both here and in England. It is reported that only a dozen or so of the machines will be bought in the United States. The South Manchurian Railway is doing a little buying here, and an inquiry for China is in the hands of Dowler, Forbes & Co., an export house, with English connections. Another export house has a list of about twenty machines for the Argentine, but it is not known whether purchasing may be expected within the near future.

Some of the large manufacturing companies in the East are known to be figuring on large lists of shop equipment, but it is clearly stated that no buying will be done at present, and the lists are merely being prepared in a time of quiet so that they will be in readiness to buy as soon as business stability is restored.

Machine tool builders are booking very little business. Many of the plants are operating at 10 per cent. or less. The dullness of business was directly responsible for the cancellation of the spring meeting of the National Machine Tool Builders' Association, which was to have been held at Atlantic City May 19 and 20. There is a bare possibility that a meeting may be called for June if business picks up.

Scrap Metal

The scrap market in some centres shows better demand, with somewhat higher quotations, but speculative considerations are a factor.

All dealers would like to pick up some cheap material for throwing down in their yards, but they have not been especially successful for the reason that the disposition of producers has been to let the material accumulate rather than sell it at the prices which have been offered. It is very doubtful if heavy melting steel could be bought for less than \$15 per gross ton, delivered, on the Pittsburgh market.

The transactions on the New York market are so few that it is difficult to determine actual prices. The only inquiry of interest during the past week was that of the Bethlehem Steel Co. for from 25,000 to 30,000 tons of heavy melting steel at \$11 per ton, delivered. Some dealers consider it doubtful if such a large tonnage can be obtained at present for this price.

Though a better feeling is evident on the Buffalo market, sales do not bear out the feeling. One buyer claims to have been offered by Pennsylvania dealers locomotive grate bars delivered to his yard near Buffalo at \$13.50 per gross ton. Car wheel prices are down \$1 per ton. A sale of 2,000 tons of heavy melting steel was made recently at \$13.

As a result of several mills coming into the market there was considerable revival of activity in the scrap market at Cleveland during the week. A Cleveland mill purchased 3,500 tons of shoveling turnings at \$8.50. A Canton mill is again accepting shipments which it had held up for several months. As a result of buying by mills, there is some demand from dealers for heavy melting steel at \$13 for Youngstown delivery.

On the Chicago market dealers in anticipation of better demand are bidding against each other for railroad material which they are stocking in their yards, and present buying prices on a number of commodities have advanced under the stimulus of speculative purchases.

Pig Iron Market

The outstanding feature of the pig iron market at Pittsburgh, has been the abandonment by merchant producers of the steel making grades of their recent price position which involved quotations of \$25, furnace, for basic and \$27, furnace, for Bessemer, and a refusal to consider less on the ground that these prices represented costs. These interests have no fixed quotation now, and are ready to consider bids.

Sales, on the New York market, have been limited to small lots, but the feeling in the market is somewhat improved. Foundrymen report a slow but encouraging increase in their melt and the settlement of the wage controversy by the Stove Founders' National Defence Association gives rise to the belief that many strikes now pending may be adjusted on an equitable basis, and that the demand for pig iron will increase.

On the Boston market the activity cen-

tres in Pennsylvania iron. One lot of 1,000 tons of No. 2X was sold this week by an eastern Pennsylvania furnace to a Massachusetts consumer. It is intimated that the price was around \$24, furnace, but the terms are confidential.

A few more foundry pig iron consumers are showing an inclination to buy for two or three months ahead on the Philadelphia market, but sellers are discouraging such business. One furnace declined to accept an order for May-June-July shipment, its present quotations holding good only for delivery within thirty days.

A Cleveland automobile foundry has released shipping orders for 2,000 tons of foundry iron per month; a steel plant has released 5,000 to 6,000 tons per month, and a Michigan automobile foundry has released four or five carloads a week, this being the first iron this foundry has taken in several months.

Conditions in foundries in the Chicago district are slowly but steadily improving. Contracts for automobile castings are being let and while this work is not evenly distributed it has been reflected in a fair number of orders for pig iron for prompt shipment.

FARM MACHINERY MARKET IS FLAT

**Explanation Given At Harvester Plant
In Hamilton for Closing
Down the Works**

In a recent edition of the International Harvester's Bulletin is the report of A. H. Young, manager of the International relations, showing why it is necessary to close down for the present. Mr. Young stated that the present rate of exchange, and the extreme poverty of European countries have operated to completely cut off export trade, which amounts to 50 per cent. of the Harvester business. The tremendous reduction in the price of farm products, the large sums spent for high priced seed and labor last year, has made the farmer unwilling to sell at the present greatly reduced prices. They simply cannot buy new machines at their present high cost; and not only that—they are organizing and say they are not going to buy until the I. H. C. and other makers have reduced their prices, so that our domestic trade has also fallen flat, and therefore our manufacturing program for the future is not encouraging.

The death occurred at Gananoque on May 2 of David Bain, general superintendent of the Ontario Steel Products Co. Thirty-five years ago he entered the Axle Company as foreman, and remained with it until it was merged in the Ontario Steel Products Co., becoming its general superintendent. Mr. Bain has been a resident of Gananoque for more than forty years, coming there as a machinist from Carleton Place to enter the company of his cousin, the late George Gillies.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	\$25 00
Lake Superior, charcoal, Chicago. 40 50	
Standard low phos., Philadelphia. 41 50	
Bessemer, Pittsburgh	28 96
Basic, Valley furnace	26 00
Toronto price:—	
Silicon, 2.25% to 2.75%	34 10

IRON AND STEEL

Per 100 lbs. to Large Buyers	Cents
Iron bars, base, Toronto	\$4 00
Steel bars, base, Toronto	4 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	3 75
Steel hoops	4 50
Tire steel	4 00
Spring steel	6 00
Band steel No. 10 gauge and 3-16 in. base	4 00
Chequered floor plate 3-16 and heavier	6 00
Bessemer rails, heavy, at mill....	2 35
Steel bars, Pittsburgh	2 10
Tank plates, Pittsburgh	2 20
Structural shapes, Pittsburgh	2 20
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

FREIGHT RATES

	Per 100 Pounds.	
	C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

Current surcharge, 8 per cent.

METALS

	Gross.	
	Montreal	Toronto
Lake copper ..	\$18 00	\$17 50
Electric copper ..	17 50	17 50
Castings, copper ..	17 25	18 00
Tin	38 00	39 00
Spelter	7 75	7 50
Lead	6 50	7 50
Antimony	8 00	8 25
Aluminum	34 50	30 60

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	\$5 00	\$4 75
Plates, ¼ up	4 50	4 25

PIPE—WROUGHT

Standard Butt-weld Pipe S/C

	Steel		Gen. Wrot Iron	
Size	Blk.	Galv.	Blk.	Galv.
1½ in.	\$ 6 50	\$ 8 50	\$ 5 91	\$ 8 01
2 in.	4 89	6 99	5 91	8 01
2½ in.	4 89	6 99	5 91	8 01
3 in.	6 50	8 03	7 95	9 48
3½ in.	7 99	10 06	9 95	12 02
4 in.	11 82	14 88	14 71	17 77

1½ in.	15 99	20 13	19 90	24 04
2 in.	19 11	24 06	23 79	28 74
2½ in.	25 72	32 38	32 01	38 67
3 in.	40 66	51 19		
3½ in.	53 17	66 94		
4 in.	67 62	84 18		
	80 12	99 74		

Standard Lapweld Pipe S/C

Per 100 feet.

	Steel		Gen. Wrot Iron	
Size	Blk.	Galv.	Blk.	Galv.
2 in.	\$29 42	\$36 08	\$35 71	\$42 37
2½ in.	44 17	54 70	54 11	64 64
3 in.	57 76	71 53	70 76	84 53
3½ in.	69 46	86 02	85 10	101 66
4 in.	82 30	101 92	100 83	120 45
4½ in.	95 89	1 20	1 30	1 54
5 in.	1 12	1 40	1 52	1 80
6 in.	1 45	1 81	1 97	2 33
7 in.	1 89	2 37	2 53	3 01
8 in.	1 99	2 49	2 66	3 16
8½ in.	2 29	2 87	3 07	3 64
9 in.	2 74	3 43	3 67	4 36
10 in.	2 54	3 18	3 41	4 05
10½ in.	3 25	4 10	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4-in. and under, 50 per cent.	
4½-in. and larger, 40 per cent.	
4-in. and under, running thread, 20%.	
Standard couplings, 4-in. and under, 20%	
Dd, 4½-in. and larger, net.	

OLD MATERIAL

Dealers' Average Buying Prices

	Per 100 Pounds.	
	Montreal	Toronto
Copper, light	\$ 8 50	\$ 9 00
Copper, crucible	11 00	11 00
Copper, heavy	10 50	11 00
Copper wire	11 00	11 00
No. 1 machine composition	9 50	9 75
New brass cuttings ..	7 00	8 00
Red brass turnings ..	7 50	8 00
Yellow brass turnings ..	5 00	6 00
Light brass	3 50	5 00
Medium brass	5 50	6 00
Scrap zinc	4 00	4 00
Heavy lead	3 50	4 00
Tea lead	2 00	2 00
Aluminum	12 00	10 00

	Per Ton	Gross
Boiler plate	\$10 00	\$12 00
Heavy melting steel ..	9 00	14 00
Axles (wrought iron) ..	22 00	20 00
Rails (scrap)	12 00	14 00
Malleable scrap	12 00	20 00
No. 1 machine cast iron	22 50	25 00
Pipe, wrought	8 50	8 00
Car wheel	25 00	25 00
Steel axles	18 00	18 00
Mach. shop turnings ..	5 00	6 00
Stove plate	20 00	20 00
Cast boring	3 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent	Net list
Carriage bolts, 7-16 and up....		15
Carriage bolts, ¾" and less		15
Coach and lag screws		—20
Stove bolts		55
Wrought washers		—25
Elevator bolts		Net
Machine bolts, 7-16 and over..		—5
Machine bolts, ¾-in. and less..		—30
Blank bolts		Net

Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add \$2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less.	27½
Burrs only, list plus	10
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	\$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze ...	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1½ to 1½" ..	Less 30%
Semi-finished nuts 1½ to 2 in..	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Plus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	\$43 50
Open-hearth billets	43 50
O.H. sheet bars	39 00
Foreign billets	48 50
Wire rods	48 00

NAILS AND SPIKES

Wire nails, base	\$4 55
Cut nails, base	5 10
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10½
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

POLISHED DRILL ROD

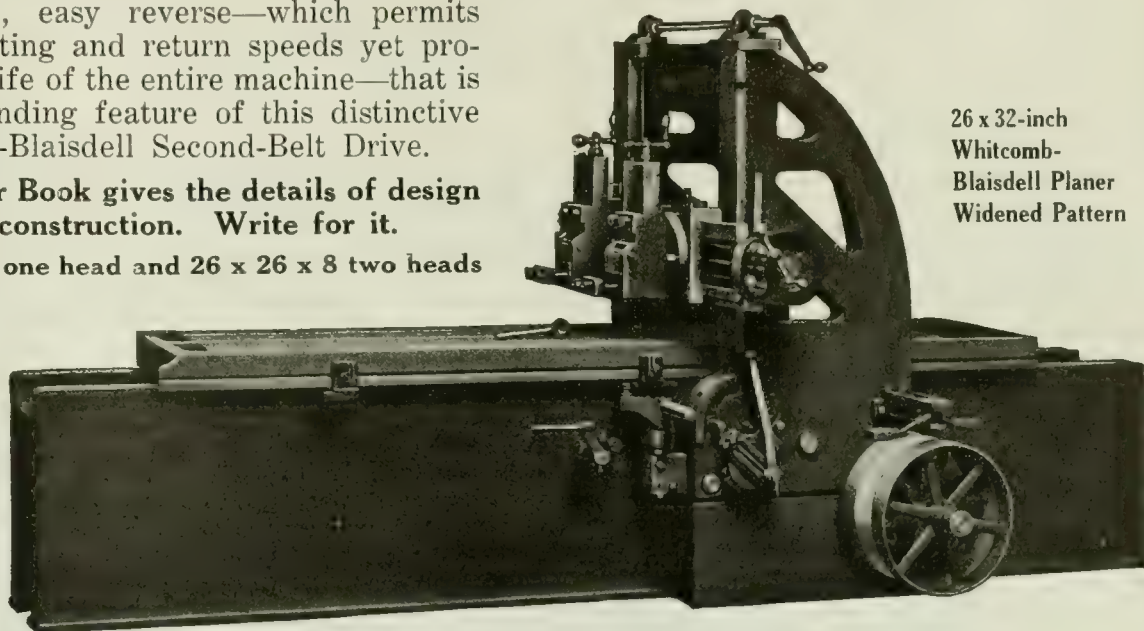
Discount off list, Montreal and Toronto	Net
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The Planer with the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine—that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

24 x 24 x 6 one head and 26 x 26 x 8 two heads in stock.



26 x 32-inch
Whitcomb-
Blaisdell Planer
Widened Pattern

THE A. R. WILLIAMS MACHINERY CO., LIMITED

Halifax, St. John,
Montreal, Winnipeg, Vancouver

If it's Machinery—Write "Williams"

64 Front Street West
TORONTO

Greaves-Etchells Electric Furnace

FURNACES FOR EVERY PURPOSE

Electric Furnace Construction Co.

908 Chestnut Street

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CASTINGS

MALLEABLE AND GREY IRON

FITTINGS Limited, OSHAWA

THE



FOUNDRY GALT, ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send as a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. Ask us.

We have for our and your requirements, a large stock of assorted White Iron Stars, suitable for light agricultural to medium weight machinery castings, while they last, at 8 cents per lb. F. O. B. Galt.

Apprentice Should Have an Education

Many of The Boys Who Go Into The Business Do Not Seem to Understand That There is Real Study and Work Before the Status of a Real Machinist Can Be Attained

By CECIL H. SMITH

REAMS of paper have been used in the attempt to describe an ideal method of making machinists, but so far no method has been discovered that will produce a good mechanic out of every apprentice. Conditions being equal, the apprentice system is far superior to the breaking in of handy men. True, success has been attained in many instances through the using of mechanically inclined handy men, but had these same men served an apprenticeship in their younger days, they would have had a wider usefulness and been more independent.

Conditions during the past few years have changed to such an extent that the old-fashioned, all-round machinist is almost a thing of the past. While some of the larger plants have organized part time schools to supplement the work of the shop, there has been very little accomplished by the average shop in Canada to make the most of their apprentices. To my mind co-operation between the manufacturer and the boys will accomplish a great deal, and following are a few suggestions which I believe could be followed out to good advantage.

The Plant's Reputation

When employers begin to regard the making of their mechanics as equally important with the quality of their product, then we will secure better all-round machinists who will be a credit to the trade. A machinist developed and trained in a shop is as much the product of that plant as the rest of the machine tool equipment. The class of mechanic turned out will, to a large extent, give the firm a good or indifferent reputation. I remember a case in point. A mechanic was applying for a position in Winnipeg. On being asked where he served his time, he named a certain plant in Ontario. "Oh, that's where you come from?—well, consider yourself engaged." This is not an imaginary incident, and it proves what I firmly believe, viz., that reputation goes a long way.

Care Necessary in Getting Boys

Great care should be exercised in selecting material for mechanics. To my mind the boy should be at least sixteen years of age, have an entrance certificate and give some good reason for wishing to become a machinist. After a few months' trial, a stock taking should take place to ascertain whether he is still anxious to be a mechanic, also if he appears to have it in him to become

a machinist. Many a boy wants to be a machinist who never will become worth while as he is not suited to the business. Six months or even less should clearly demonstrate his fitness.

The chief failing that seems to exist amongst boys is that they cannot see the necessity of absorbing everything mechanical within their reach. They seem to imagine that four years in any machine shop automatically makes them a machinist, just the same as a tap will make a thread, without any effort on the part of the tap itself.

If manufacturers were to call in their apprentices to-morrow, asking them if they read the various magazines pertaining to their trade, I feel sure the answers would both surprise and disappoint them. This, in spite of the fact that such magazines can be perused free at any public library. Enter any library to-day and you will find that 90 per cent. of the men who are reading such journals are the ones holding responsible positions.

Must Have Better Education

It is my contention that the boys should be told of the need of getting this education. Ask them questions they should be able to answer, then if they cannot answer them tell them where they can obtain the information. Give them a periodical examination, one that can be prepared by the superintendent or foreman. Find out if they can calculate gearing, how to cut tapers, the principles of threading, etc. Get the fundamentals thoroughly instilled, and you need have no fear of the future of your machine shop.

On the other hand the boys should do their part in making good tradesmen of themselves, and a few suggestions from one who has passed through the mill might not be amiss. Do not be afraid of producing too much work, or doing tasks you consider beneath your dignity. It is very seldom that the right type of boy is imposed on. Use discretion in asking questions, but ask enough so that you will know WHY you are doing a piece of work in some certain manner. Think ahead, and plan your moves ahead. Do not imagine the foreman is not aware you are loafing, simply because he hasn't caught you flat-footed at it. He may say nothing about it, but that is no true sign. Perhaps it's a sign he has lost all interest in you through your own laziness.

About as good advice as I can offer is this: "Use the same enthusiasm at your work as you do in your sports. Do

not let the other fellow beat you; keep ahead, not by a spurt now and then, but by consistent application to the trade you have chosen as a life work."

PROVINCE BUILDS CEMENT PLANT

Believes It Can Turn Out the Required Supply at Price Below Market

The Ontario Legislature in committee of supply on the estimates approved of a vote of \$1,000,000 for the carrying out of Hon. F. C. Biggs' scheme to establish a provincial cement plant. The Minister explained that the amount voted would build a one-unit plant with a capacity of something over 300,000 barrels annually, which would be sufficient to supply the needs of the province for its provincial highway program. He stated the location of the plant had not been decided upon, but that the department was negotiating for options on alternative sites. It was expected that the province would be able to produce cement at prices much below those prevailing, and moreover would be assured of an adequate supply instead of having its work held up by difficulty in getting delivery.

PORT ARTHUR STACK SOLD FOR MILLION

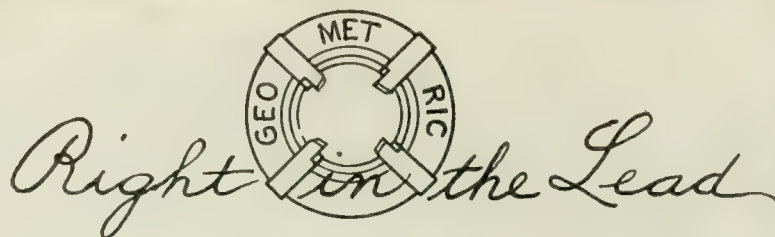
Report Says Development Work Will Be Carried On in That District

Sudbury.—A great deal of talk has been heard in the north about the development of the iron ore industry, but the first important step in that direction has just been taken, with the announcement that the Port Arthur blast furnaces have been sold for the sum of \$1,000,000.

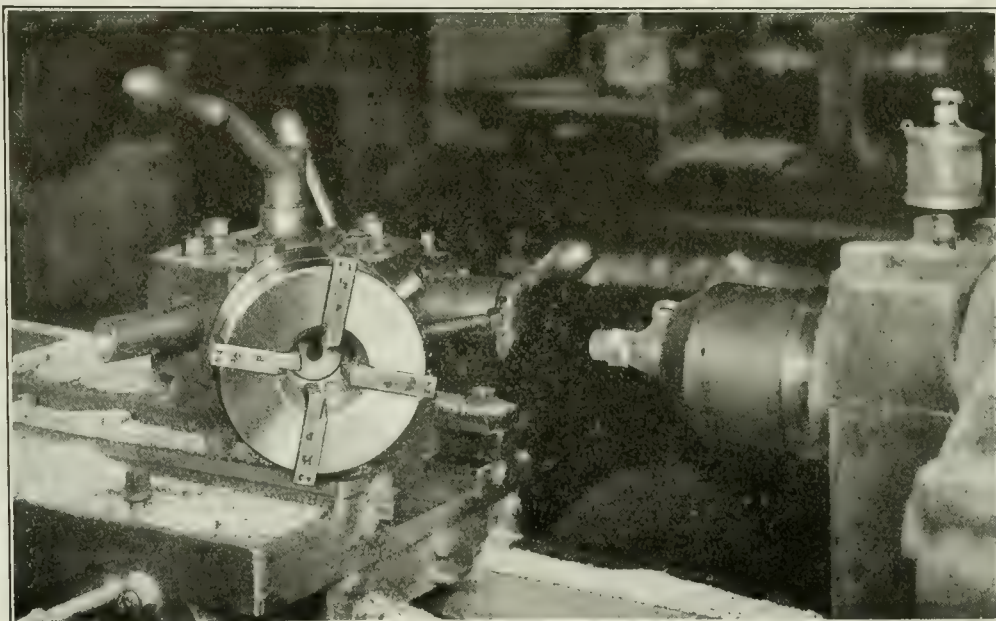
American interests are said to have concluded the deal. The terms call for the purchasers to pay \$200,000 within four years, and, if at the end of that period they decide to continue, the balance shall be paid, half of it as cash. The deal must secure the endorsement of the people of Port Arthur. The large plant has been standing idle since 1912.

It was only recently that the Atikokan mine was optioned but it is said that the two deals have no connection.

Mackenzie and Mann interests built the furnace in 1905 and operated it seven years. When operations resume 200 men will be employed.



A Busy Corner Of A Notably Successful Shop



The Geometric Die Head illustrated has just cut the $\frac{1}{2}$ -in. pipe thread on the bibb shown. The equipment of this shop consists of many standard and special Geometric Tools.

These people express themselves as very strong for the Geometric line, and are always glad to recommend the use of these Tools. They have themselves used Geometrics for a great many years.

If you can find a user of Geometric Screw Cutting Tools who is not satisfied with them, you will do us a great favor by telling us who he is and where we can find him.

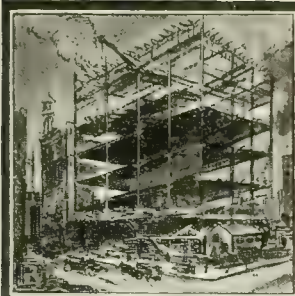
THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents :

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto,
St. John, N.B., Halifax, N.S.

If interested tear out this page and place with letters to be answered.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



TRADE GOSSIP

Want Black Pipe.—Vineland Cannery, Ltd., Vineland Station, Ont., want to know where they can secure a used steam heating system for a building 60 feet by 120 feet, or about 500 feet of used black iron pipe.

Wants Equipment.—L. R. Reynolds, Tramping Lake, Sask., wants to secure a lathe, drill press and cylinder boring machine.

Used Mill Wanted.—James Cunningham, 34 Brock Avenue, Montreal West, is in the market for a used ball mill, and tube mill, and would be pleased to receive particulars of same.

Wants Garage Equipment.—Norman Demaine, of Ashworth, Ont., wants to secure some garage equipment as soon as possible.

Garage Equipment.—D. L. Ancoin, 3187 Henri Julien, Montreal, is in the market for garage equipment, such as a drill press, air compressor and tank, two vises, forge blower and anvil 150 pounds, grinder, countershaft, shafting, hangers, pulleys, etc.

Buying Fire Equipment.—The Board of Control of Toronto is asking tenders up to May 23 for the following: One combination hose and chemical motor truck; one 75-foot aerial ladder truck, front chain drive, with tiller, gasoline driven; four automobile triple combination pumping engine, hose and chemical wagons, pumping capacity 800 Imperial gallons per minute.

Running Full Time.—Announcement was made by Wallace R. Campbell, secretary-treasurer of the Ford Motor Co. of Canada, that the main factory of the company at Ford, Ont., will start work on full time basis. The factory for the last few months has been working but four days a week.

Cancel Convention.—The National Machine Tool Builders' Association announces that its spring convention, scheduled for May 19 and 20 at Atlantic City, N.J., is cancelled. The triple convention of the American Supply and Machinery Manufacturers' Association, the National Supply and Machinery Dealers' Association and the Southern Supply and Machinery Dealers' Association will be held on May 16, 17 and 18, as planned, it

having been erroneously reported that this convention also would be cancelled.

Conditions Better.—Employment conditions in Sudbury district have loosened up to a great extent during the past week and for the first time since last summer a severe shortage of unskilled labor is reported by the employment bureau. Registrations are not falling off appreciably, however, and the men are snapped up as soon as they apply. There is a big demand for river drivers. The pay this year is from \$2 to \$3 a day with free board and lodging. General unskilled labor is also scarce, the pay for this class of work being from 30 to 35 cents an hour, the working day being from 8 to 10 hours.

Secure Contract.—The Canada Car & Foundry Co., Ltd., of Montreal, has received the contract from the Toronto Transportation Commission for 100 motor cars and 60 trailer cars. The contract price is approximately \$1,270,000 and is exclusive of electrical and air-brake equipment, for which prices are now being received by the Commission. H. H. Couzens, general manager, Toronto Transportation Commission.

Should Be Standard.—Canadian consumers are getting less coal and more dirt in what they purchase during recent years, according to J. C. Hurcomb, of the C. C. Ray Co., Ottawa, coal merchants, who was examined by the special House Committee on fuel supplies. Mr. Hurcomb believed there should be a Government standard of quality for coal and producers should be required to supply coal to that standard.

Russian Trade.—Brantford agricultural implement firms would not be adverse to trade with Russia, providing that financial arrangements were satisfactory, according to Mayor George Wedlake, vice-president and general manager of the Cockshutt Plow Co., commenting on the reported visit of M. Krasin, Soviet representative, to Canada, as has been announced. He added that a trade commissioner from Russia had been a visitor in Brantford recently, but nothing definite resulted. Soviet Russia offered a big field for agricultural implements, and the need there was great, while if trade with Russia were reopened it would mean a big thing for the agricultural implement industry and aid considerably in reviving it.

The Sidney Roofing & Paper Co., Sidney, B.C., will rebuild their plant which was destroyed by recent fire.

Yorkton Steel & Machinery, Ltd., are preparing plans for foundry.

If satisfactory agreement can be reached with the city officials, the Imperial Oil, Ltd., will build a wharf costing \$100,000 at Confederation Street, Sarnia, Ont. The company requests the city to surrender a lease on certain land required.

The plant of the Ideal Vulcanizing Co., Belleville, Ont., was destroyed by fire on April 29. George Deline, the manager, was repairing a tube and gasoline took fire. The stock of tires and accessories owned by the company was badly damaged, and no insurance was carried on the stock.

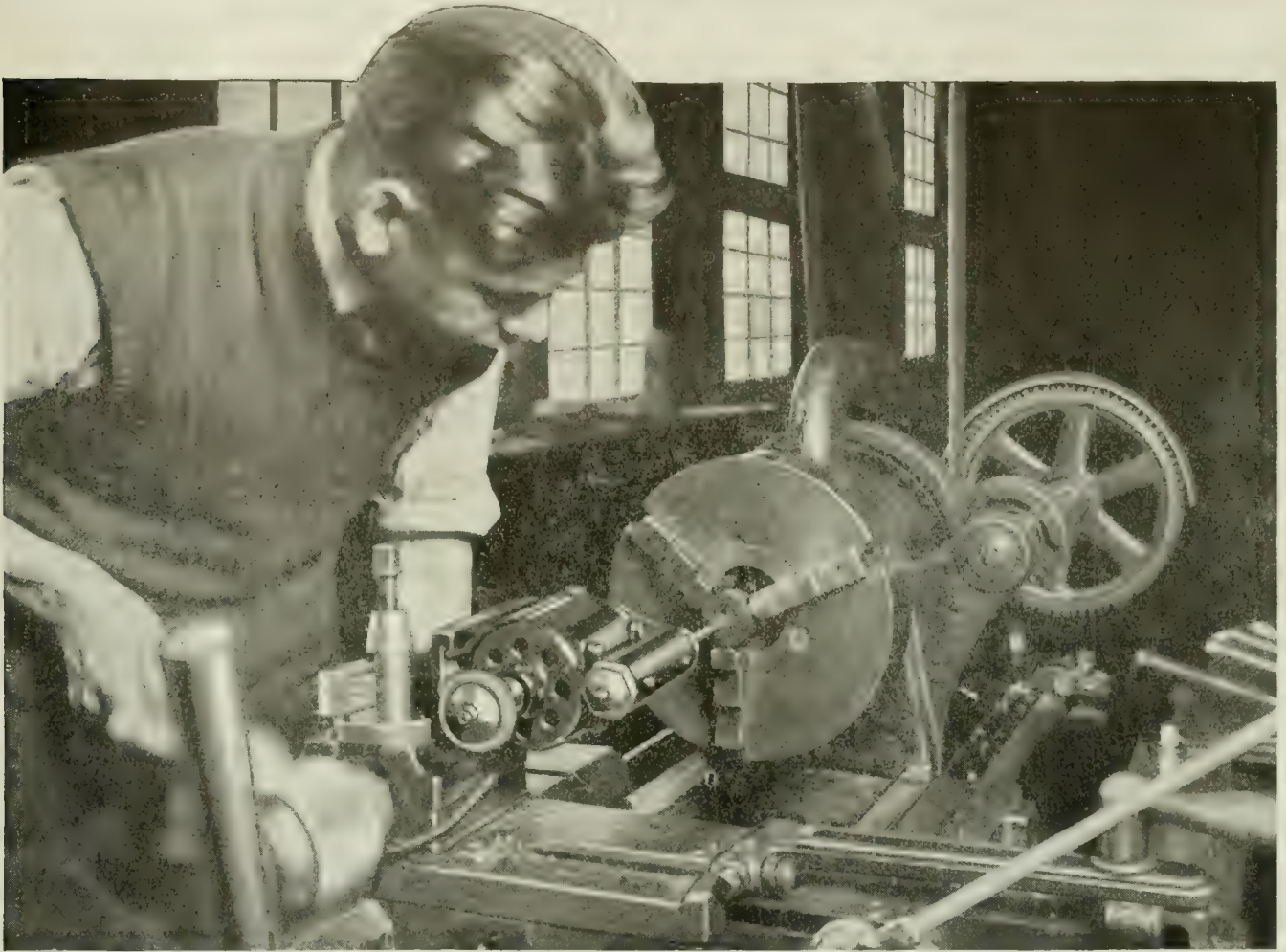
SHOW THAT THEY WANT BUSINESS

How One Dealer Sizes Up the Attitude
of Some of the American
Firms

"If American firms want to secure business in the machine tool field in Canada, they must do two things. First, they must make up their minds that they want the business that is going here, and in the second place they must prepare to go out and get it."

That is part of the conversation that took place between a Chicago man and a dealer in machine tools in Toronto.

He continued: "Too often in the past the American firm has taken it for granted that he could ship up some of his surplus and get rid of it in this country, and that attitude has resulted in the dealer here not getting the support and the backing that he should receive. There has been a very marked change in this attitude in the last three months, and it is not very hard to see the reason. Business is needed and badly needed, and right now we are getting supplied with data and up-to-the-minute information that we could never get before, and we also have promises of more advertising assistance in getting the lines better known to the trade. The Canadian market is well worth while, but it has to be studied and followed up closely to secure success."



Grinding Diameters on Ring Gages to Close Limits

In the Terry Turbine Company of Hartford, Conn., Dumore Grinders are used on jobs where accuracy is of the utmost importance.

The job shown here is a special Gage—diameter .750-in. with plus or minus limits of .0002 in. Because the Dumore grinds to extremely close limits it is just the tool for work of this character. Besides, the ease with which it can be set up for service wherever necessary gives it an advantage over other methods of

handling many kinds of work.

Dumore Grinders can be used anywhere, taking their power from the nearest lamp socket; extremely simple and durable, they offer an economical method for accurately finishing work without changing the setting.

See the Dumore at work. Ask a man who uses one. Or have your dealer give you a demonstration.

Wisconsin Electric Company
2935 Sixteenth Street - Racine, Wisconsin

DUMORE HIGH SPEED GRINDERS

SCHWAB SAYS LABOR COSTS ARE THE DETERMINING FACTOR JUST NOW

New York.—Germany, through economy and sacrifices of her working people, has settled down to real production, and is outstripping the United States and allied nations in the fight toward normalcy, Charles M. Schwab declared here in an address before the Chamber of Commerce of the State of New York.

"Germany to-day can put a ton of steel in England at a price \$20 a ton cheaper than England can make it," he said, "and is selling pneumatic tools in Detroit, where formerly we shipped such machinery to Germany and sold it cheaper than she could make it.

"The difference is solely a matter of labor costs.

Idle Workers in U. S.

"It is estimated that 5,000,000 men are out of work in this country. It is accordingly of supreme importance to the working man as well as to the capitalist to restore our prosperity.

"Never before was the need for products so great, never before was such valuable producing machinery and facility available, never before was there so much that needed to be done.

"I have just returned from Europe, and I came with renewed admiration for the courage, the enterprise, the determination displayed in Italy, Belgium,

France and England. Germany was ahead of all of them in production.

Germany May Win by Labor

"Is it possible that, after having won the war, we of the allied nations, with everything in our hands, will allow Germany to win the peace through the efforts of her labor?

"Labor, on the whole, can be paid only what labor as a whole earns, and if some sections of labor exact more than their share of the current product of the world, other sections are going to suffer. I understand that our railroads to-day pay to labor over 60 cents out of every dollar received. The labor cost of making a ton of steel to-day is 85 cents out of each dollar of total cost.

Basis of Prosperity

"In so far as our people in America are prepared to go to work at reasonable wages, in so far as we are prepared quickly to abandon the artificial extravagances of the war, will we lay the foundations for a new prosperity such as we have never enjoyed before.

"This is the route through which not merely America but the peoples of our allies can find their way out, and triumph in peace as they did in war."

MONTREAL NOTES

The Montreal offices of the Canuck Supply Company, formerly located at 416 St. James Street, have been removed to more commodious quarters at 371 Aqueduct Street.

W. J. Brown, manufacturers' agent, 117 Youville Square, Montreal, has taken the Eastern Canadian agency for R. S. Newall and Son, of Liverpool, England, manufacturers of wire rope since 1838.

The marriage took place a few days ago of Walter R. Kingsland and Miss Lorna M. Clerk. Mr. Kingsland is on the sales force of the A. R. Williams Co., Montreal.

A. H. Chase, of A. H. Chase & Co., has arrived back in Montreal after a six months' touring trip in the South. This firm is now acting as distributors for the Mechanical Engineering Company of Three Rivers.

The Swedish Steel and Importing Co. are moving their offices from 137 McGill Street to 170 McGill Street, where they have taken over the entire fourth floor of the building. They are contemplating extension to their present activities.

On the occasion of his recent marriage Mr. Charles Bulley, educational instructor of apprentices at the Angus shops of the C. P. R., was presented with a beau-

tifully engraved gold watch by the apprentices of the different departments, in appreciation of the great interest he had always taken in advancing the learning of the boys under his charge. Mr. C. Kyle, supervisor of apprentices, presided at the meeting.

The Blashill Wire Machinery Co., of Montreal, are in the market for a portable electric welder capable of handling the work of butt welding wire up to and including No. 9 gauge. This firm has vacated the ground floor of No. 307 St. James Street and taken offices upstairs in the same building. They expect to be making wire fencing in a very short time, construction operations taking place at their Shearer Street plant.

The last construction order now on the books of the Canadian Vickers Company will be completed before the close of the present month. Wednesday of next week has been set aside for the launching of the Norwegian cargo vessel, "Topdalsfjord," a sister ship to the Idefjord which was placed in the water a couple of weeks ago. When this vessel has been completed it will end the building operations at this yard, unless in the meantime additional business has been secured, and in the face of the present high costs of construction and the sur-

plus of available bottoms, this seems very unlikely. It has been reported that the Government are in the market for an ice-breaker, but nothing definite has been announced as to who will receive the contract.

The order placed with the Canadian Car and Foundry Company by the Toronto Transportation Commission for street car equipment to the extent of a million and a quarter dollars is expected to keep the plant in operation for a couple of months. Some little time will elapse before actual construction will be commenced, as it will require a few weeks to get the material together that will be required for the work. It was stated by officials of the company that the present agreement with the men will be extended during the period necessary for the completion of this contract, but at the expiration of the order the question of wages and working conditions will come up for consideration. Ordinarily the agreement with the men would terminate on the first of May, so that this car order will give an added lease of life to the employees of this plant.

A very successful working test was made last week of the two new 30,000,000 gallon electrical pumps recently installed at the low level pumping station of the Montreal water works. These pumps will be put into regular service immediately, and with the other electrical unit that has been in operation for the past two years, will deliver approximately 75,000,000 gallons daily. It may be necessary to use some of the steam units but the majority of the steam pumps will be held in reserve and used only in cases of emergency. Plans are now under way whereby the entire amount of water required for the uses of the city will be filtered. At present the filtration plant has a capacity of about 50,000,000 gallons per day, and when the new additions are installed, at a cost of about \$2,000,000, it is expected that about 120,000,000 gallons will pass through the beds daily.

Work is being started on an \$80,000 packing plant by the Mace Construction Co. for the Dumart Packing Co., Ltd., Kitchener, Ont. The Mace Construction Co. is being organized by Mr. Mace, care of Wm. F. Sparling & Co., 54 University Avenue, Toronto.

Steps are already being taken by the Northern Canada Power, Ltd., to help prevent a repetition of the power scarcity which prevailed last fall in the North country. At the present time a conservation dam is being erected at Kemoganissee Lake, on the Metagami River, with a view to increasing the storage water for the power. It has been stated by mining men just back from Northern Ontario that the water is exceptionally high, in fact it has never been known before to be as high as it is north of the height of land.

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Them
At.

Aikenhead's

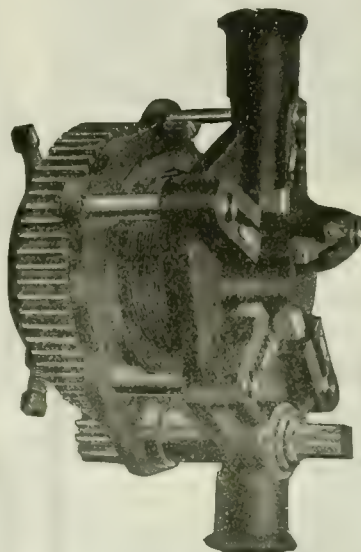
The Home
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Fine
Tools

PIPE THREADING TOOLS

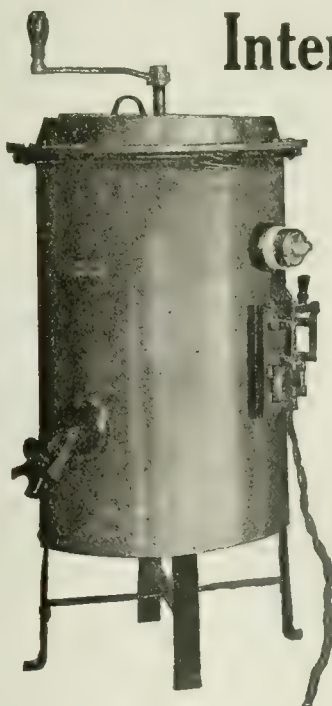
BEAVER, TOLEDO, JARDINE, OSTER

These tools possess unusual features that result in perfect operation and the greatest economy. The taper thread is not formed by taper dies, but by a receding motion of the cutters from the pipe centres as the die advances. This is a tremendous advantage, since it eliminates friction, and with half the exertion required with a tapered die makes a thread of perfect taper equal to lathe work.

There are many more valuable and exclusive features. Let us tell you about them.



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The "International" not only keeps the glue in more perfect condition but soon saves its cost in time saved and in more economical current consumption. The one quart heater consumes only one cent's worth of current per day, while the 13 quart consumes less than the ordinary electric flat iron. The "International" has three heats—full, medium and low. **Full** heat is used for melting. **Medium** provides a lower degree of heat for holding the glue at the correct working temperature of 145 to 150 degrees Fahr., at which temperature glue has the greatest tensile or "sticking" strength. **Low** heat holds the glue at the correct temperature when it is not being used but when it is desirable to keep it hot and ready for instant use. Full information and prices are yours for the asking.



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Upon the Health of your employees depend your profit and production



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Throw out the germ-laden Drinking Cup!

Give your men a clean drink

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(MADE IN CANADA) DRINKING
FOUNTAIN



Allows just the proper amount of cool, clean, fresh water to come through the bubbler. No spurring, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

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Fountain Co.**

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Machine Springs, Valve Springs, Automobile
Coil Springs, etc., of a quality that defies
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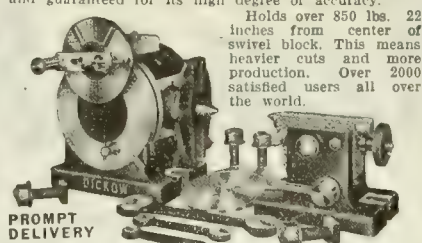
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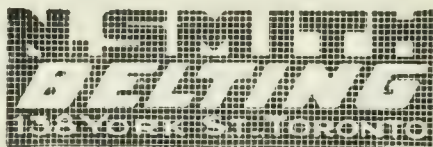
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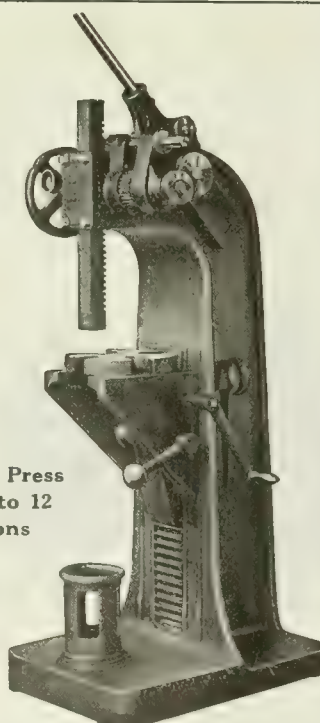
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NEWS OF THE C.E.S.A.

A meeting of the main committee of the Canadian Engineering Standards Association was held at Ottawa recently, Sir John Kennedy in the chair, and the following were some of the more important matters dealt with: Sir John Kennedy was re-elected chairman; Mr. T. A. Russell and Mr. H. H. Vaughan were re-elected vice-chairmen, and Dr. J. B. Porter was re-elected honorary secretary-treasurer.

The following gentlemen were welcomed as members of the main committee: Mr. J. B. Reade, Purchasing Commission of Canada; Mr. G. A. Mountain, Board of Railway Commissioners for Canada; Lt.-Col. E. W. Stedman, the Air Board; Dr. L. V. King, McGill University; Mr. T. F. Sutherland, Canadian Institute of Mining and Metallurgy.

The attendance of Mr. R. J. Durley, secretary of the conference of secretaries of national standardizing bodies in London, was approved. This conference is of an informal nature and is intended to facilitate the interchange of information and data regarding standardization, especially in its international aspect, and with regard to planning the methods of intercourse and co-operation to be adopted between the various national standardizing bodies. It is expected that the meeting will be attended by delegates from Belgium, Great Britain, Canada, France, Holland, Italy, Sweden, Switzerland, and the United States. Each secretary will present a report on the work of the conference to his committee or council on his return.

The activities of the association during the past year and the present state of the work of the various committees are briefly covered by the attached report. Among the subjects on which the association has recently been requested to take action may be mentioned the following:

A request from the Air Board has been made for the preparation of specifications for certain aircraft materials which cannot be obtained under commercial conditions in Canada, the war-time specifications of the British Air Board being much too elaborate for use under peace conditions. The necessary committees are being arranged for. Co-operation with the American engineering standards committee has been requested in connection with the aeronautical safety code, the American safety code for logging and sawmill machinery, and the American committee which is considering the standardization of parts of elevator machinery.

Requests for co-operation have also been received from the Canadian Electric Railway Association and the American Gear Manufacturers' Association.

In connection with the work of the sub-committee on Portland cement which is engaged in revising and redrafting the specification for that material originally issued by the Canadian society of

civil engineers, the main committee approved of the suggestion of the sub-committee as to the desirability of experimental work on Canadian cements with regard to the best method of determining normal consistency. The main committee also directed that arrangements should, if possible, be made with the proper authorities for the standardization of cement sieves in Canada.

MAKING BOLTS FIT TIGHT

In connection with some work on American battleships, a report of the Bureau of Standards says it was found necessary to use bolts capable of withstanding unusually high shearing stresses. The best type of bolt for such purposes is one having a tight bearing over its entire length. The bureau was requested to devise a method by which such tight-fitting or "body-bound" bolts could be secured. Two methods were tried, both of which gave satisfactory results.

In the first case the bolts were finished a little larger than the holes in the plates. They were then immersed in liquid air until they contracted sufficiently to enter the holes quite easily. Upon warming up, the bolts expanded, gripping the plates tightly. In the second method each bolt was provided with a small hole along its axis and was finished to be an easy fit in the plates.

After insertion a charge of powder was exploded in the small hole. This expanded the bolt, causing it to grip the plates. Subsequent physical tests indicated that the strengths of the joints secured by both methods were sufficiently high for the purpose.

COMPARATIVE OUTPUT OF PIG AND STEEL

The National Federation of Iron and Steel Manufacturers, London, England, has put the comparative output of pig iron and steel among the five leading countries as follows:

Pig iron

	1913	1920
United States ...	30,966,000	36,403,000
United Kingdom.	10,260,000	8,008,000
Germany	19,007,000	*7,000,000
France	5,126,000	3,265,000
Belgium	2,445,000	1,113,000

Total 67,804,000 55,789,000

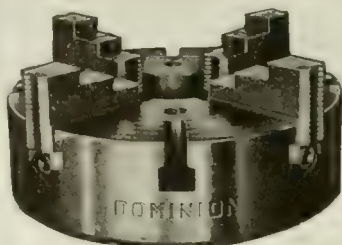
Steel

	1913	1920
United States ...	31,301,000	40,773,000
United Kingdom.	7,664,000	9,057,000
Germany	18,648,000	*9,000,000
France	4,620,000	2,915,000
Belgium	2,428,000	1,216,000

Total 64,661,000 62,961,000

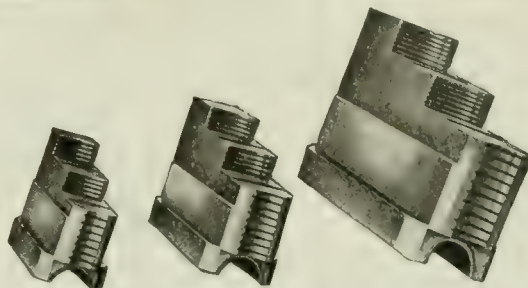
*Estimated.

The data for Germany for 1920 are stated to be a rough estimate since Germany declines to publish figures of iron and steel production.



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BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

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CLOSING TIME

Condensed advertisements for this section must be in our composing room Tuesday morning prior to day of issue. Display advertisements for this section must be in Monday afternoon.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

Canadian Machinery

Used Machinery For Sale

- 1 12" x 7" Engine Lathe
 - 1 10" x 6" Bertram Lathe
 - 1 18" x 8" Stevens Lathe
 - 1—12" Drill Press
 - 1—20" Drill Press
 - 1 30" x 50" x 10' Bertram Planer
- CHARLES P. ARCHIBALD & CO.**
285 Beaver Hall Hill MONTREAL (52)

Boilers—Firebox—40 h.p.
Boilers—Economic Type
—20, 30, 40, 60, 80,
100 h.p.

Boilers—Tubular—40, 50,
70, 80, 100, 150, 175
h.p.

Boilers — Water-tube —
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Engines — Corliss, Auto-
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sizes.

Pumps—Steam, Centri-
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Woodworking Machinery
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Generators and Motors.
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Foundry Blowers—2 General
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The Electric Motor and Machinery Co., Ltd., 64 Wellington Street West, Toronto, Ontario, wish to announce the commencement of their sales agency for the
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- Both Direct and Alternating Current Units.
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- 2—34 in. x 12 ft. Phoenix with stacks.
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- 1—300 hp Stirling, 160 lb.
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1—Centrifugal Pump, 2 1/2 in. x 1 1/2 in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

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WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (ctfm)

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ELECTRIC STORAGE BATTERY LOCOMOTIVES for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal. (ctfm)

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Ga. 18, 20, 22, 23.

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Ga. 18 to 29. Size 30" x 96".

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16 x 8 Lodge & Shipley, selective geared head, complete with 3-jaw chuck.

16 x 8 McDougall, complete with taper turning attachment and 12" chuck.

16 x 6 Rahn Larmon, 3 step cone, S.B.G., Q.C.G., in first-class condition.

66 x 14 H.R.T. Dymont boiler, complete with fittings, 100 lbs. pressure.

20" Barnes Drill, W and L feed, T and L pulley, in A1 condition.

No. 1 Racine High Speed Hack Saws.

A full line of new milling machines, plain and universal, equal to number two's, complete with dividing heads, vertical attachments and pump. Write in for particulars.

I am offering these exceptional millers at the cut price of \$1,500, f.o.b. anywhere in Canada.

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- 1—30" x 12' "Blaisdell" (used).
- 1—30" x 14' "Niles-Bement-Pond" (used).
- 1—26" x 14' Niles-Bement-Pond, 2 C.G., (used).
- 1—24" x 10' "Milwaukee" (new).
- 1—18" x 8' Rae, Q.C.G. (new).
- 1—16" x 8' Reed, Q.C.G. (used).
- 1—12" x 8' "LeBlond" Tool Room (used).
- 1—12" x 6' Worcester, Q.C.G. (used).
- 1—8" "Rivett" with Cabinet, several attachments, (used).
- 1—7" Cataract Precision, several attachments (used).

GAP LATHES

- 1—38" x 54" x 12' Bertram (used).
- 1—22" x 40" x 16' McDougall (used).
- 1—21" x 30" x 7' South Bend.
- 1—20" x 38" x 12' C.M.C. (used).

TURRET LATHES

- No. 4 Millhollands, capacity 1½" (used).
- Several Davis and other makes. Various capacities.

SHAPERS

- 1—16" "MacKenzie" B.G. Crank Shaper, (new).
- 1—16" "Rae" B.G. Crank Shaper (slightly used).
- 1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

PLANERS

- 1—42" x 42" x 20' Putnam, 1 head (used).

- 1—30" x 30" x 10' Pond, 1 head (used).
- 1—24" x 24" x 6' Powell, 1 head (new).

MILLING MACHINES

- 1—Briggs High Duty, Type "A," 22" Traverse (new).
- 1—Briggs High Duty, Type "B," 42" Traverse (new).
- 1—Whitney Hand Miller, 18" x 6" table (used).
- 1—No. 3 Ford-Smith Plain (used).
- 1—No. 3 Ford-Smith Universal (used).
- 1—No. 4 Cincinnati Plain (used).

DRILLS

- 1—10" Burke Sensitive (Bench type) (new)
- 1—16" No. 2B Edlund H.S. Sensitive (new)
- 20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
- 1—36" C.M.C. Heavy Duty (used).
- 1—3-spindle 20" Silver Gang Drill (used).
- 3—4-spindle W. & R. Sensitive (cap. 1½") (used).

BORING MACHINES

- 1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
- 1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
- 1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

POWER HACK SAWS

- 1—No. 10 Racine 8" x 8" Cap. (new).

- 1—No. 7 Watkins 9" Cap., 18" Blade (used).
- 1—No. 1, 6" x 6" Racine (used).
- 1—No. 3 Robertson 6" x 6" (used).

AIR COMPRESSORS

- 1—8" x 8" Sullivan, Class W.G.-3, Belt driven (used).
- 1—8 x 10 x 8 Bury, Steam driven (used).
- 1—12" x 18" Ingersoll-Sargent, belt drive (used).
- 1—12" x 12" Can. Ingersoll Rand NE-1 (used).

GRINDING MACHINES

- 1—Landis No. 4 Universal (used).
- 1—Landis Plain, self-contained, 36" x 12" (used).
- 1—Fitchburg Cylindrical, 8" x 36" (new).
- Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

MISCELLANEOUS

- 2—No. 4 Jno. Hall Pipe Machines (1 used) (1 new).
- 1—Lennox Rotary Bevel Shear, 1" Cap. (new).
- 1—High Speed Riveting Hammer, No. 3A (used).
- 1—Beaudry Champion Power Hammer, No. 9 (used).
- 1—"Grant" Rivet Spinning Machine, No. 80A, (new).
- 1—"Grant" Rivet Spinning Machine, No. 80B, (used).
- 1—Arbor Press, No. 4 "Greenard" (new).

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In Stock at Montreal

DRILLS FOR RADBORE ATTACHMENT

- 1—¾"—B.
- 1—1"—B.
- 1—1¼"—B.
- 1—1½"—B.
- 1—1¾"—A.
- 1—1⅞"—A.

DRILLS, ELECTRICAL

- 1—Dumore Sensitive Bench Drill, Model 2 A.D., Universal Motor, 2/16" capacity.
- 1—¾" U. S. E. Co. Universal Motor Drill, 110 v., type EU.
- 2—½" Type DAU Electrical Tool Co.'s Drills.
- 1—½" Type DU Electrical Tool Co.'s Drill.
- 1—5/16" Type BUA Electrical Tool Co.'s Drill.

BUFFERS

- 1—No. 8 Perfect Buffing Machine complete.
- 1—No. 8 Perfect Buffing Machine complete (New Style).
- 1—No. 6 Perfect Buffing Machine complete.

GRINDERS

- 1—No. 1 B. & S. Universal Grinder (Used).
- 1—1-A Wells Drill Grinder, cap. 1 16" to 1 ¼".
- 1—No. 4 McDougall Grinder Comp., cap. 14 x 2 x 1½.
- 1—No. 6 Perfect Grinder and Countershaft, cap. 12 x 2 x 1.

- 2—No. 10 Perfect Grinder Bases Only, cap. 10 x 1½ x ¾.
- 1—No. 2 Blount Grinder Head Comp., cap. 8 x 1 x ½.

GRINDERS, ELECTRICAL

- 1—U.S. Elec. Grinder, Type HJU, 110 v.
- 1—U.S. Elec. Grinder, Type J DC Motor (Used).

HACK SAWS

- 2—No. 0 Perfect Power Hack Saws, cap. 6 x 6.
- 2—No. 2 Perfect Power Hack Saws, cap. 6 x 6.
- 2—No. 3 Perfect Power Hack Saws, cap. 6 x 6.

MILLING MACHINES

- 1—No. 0 B. & S. Plain Milling Machine, with Pump.

PRESS

- 1—No. 173 Brown-Boggs Foot Press, with Legs.

PIPE MACHINES

- 1—Hall No. 6 Standard Improved Pipe Lathe, cap. 1 to 6", complete with 5 sets of dies.
- 1—Hall No. 4-W Simplex Pipe Lathe (Oster Type), cap. 1" to 4", weight 1,400 lbs.

- 1—Landis 6" Pipe Threading Machine with Chasers.

- 1—Landis No. 4 Stationary Pipe Die Head, with set of 8 Pitch High Speed Chasers.
- 1—Landis 8" Stationary Pipe Die Head, with set of 8 Pitch High Speed Chasers.
- We have in stock pipe chaser holders and large assortment (about 345 sets) Chasers.

SHAPERS

- 1—16" Walcott Back Geared Crank Shaper.

MISCELLANEOUS

- 1—Cowan Wood Bench Lathe, 12".
- 1—MacKenzie Combination Saw Table.
- 1—Elliot No. 5 Woodworker, Motor Driven, Motor 110, 200 v., 60 cycle, single phase, 1,725 r.p.m.
- 1—¾" Plug for Claffin No. 2 Beater.
- 1—No. 30 Style A Casler Offset Boring Head.
- 1—No. 40 Style A Casler Offset Boring Head.
- 1—No. 60 Style A Casler Offset Boring Head.
- 1—No. 80 Style A Casler Offset Boring Head.
- 1—No. 306 Boring Bar, Casler.
- 1—No. 409 Boring Bar, Casler.
- 1—No. 612 Boring Bar, Casler.
- 1—No. 615 Boring Bar, Casler.

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Machinery Stock List

In Stock at Toronto

TURRET LATHES

- 1—Gisholt "H," 21", Standard Turret Lathe, complete.

ENGINE LATHES

- 1—McDougall 26" x 14', D.B.G. and Q.C.G. Engine Lathe.
 1—20" x 10' Walcott, D.B.G. and Q.C.G. Engine Lathe.
 2—26" x 12' Walcott, D.B.G. and Q.C.G. Engine Lathes.
 1—20" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
 1—18" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
 1—14" x 6' Walcott, D.B.G. and Q.C.G. Engine Lathe, with taper attachment.
 1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., Gear Box taper attachment, draw-in chuck, one collet and regular equipment.
 1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., taper attachment, compound rest relieving attachment, draw-in chuck, and one 1/2" collet and oil pan.

- 1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G., Taper Relieving and draw-in attachments and pan bed.

- 1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and pan bed.

- 1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and standard equipment.

- 1—Seneca Falls 11" x 6', Quick Change Gear Lathe.

- 1—Seneca Falls 9" x 4', Plain Engine Lathe.

SCREW MACHINES

- 2—No. 2 Brown & Sharpe Automatic Screw Machines.

- 1—No. 0 Brown & Sharpe Automatic Screw Machine.

- 1—Warner & Swasey (used) No. 4 Hand Screw Machine, pan bed, friction head, without power feed to turret.

- 3—Foster No. 4 Hand Screw Machines (used), with friction head, pan bed, without power feed to turret.

MILLING MACHINES

- 2—Brown & Sharpe No. 1 Universal Milling Machines.

- 2—Brown & Sharpe No. 2 Universal Milling Machines.

- 1—Brown & Sharpe No. 2A Universal Milling Machine.

- 1—Ford-Smith No. 2 Universal Milling Machine.

- 1—Ford-Smith No. 3 Universal Milling Machine.

BOLT THREADING MACHINES AND ACCESSORIES

- 1—Landis 1" Double Head Bolt Threading Machine with leadscrew attachments.

- 1—Landis 1 1/2" Single Head Bolt Threading Machine.

- 1—Landis 2" Single Head Bolt Threading Machine.

- 3—Landis 1/2" Rotary All Steel Bolt Die Heads.

- 3—Landis 1" Rotary All Steel Bolt Die Heads.

- 3—Landis 1 1/2" Rotary All Steel Bolt Die Heads.

- 2—Landis 2" Rotary All Steel Bolt Die Heads.

- 1—Landis 1 1/4" Automatic Die Head.

In Stock at Montreal

- 1—Gisholt 21" Std. Turret Lathe, 3 1/2" Spindle, comp. with set boring and turning tools.

- 1—McDougall 26" x 14', D.B.G., Q.C.G. Engine Lathe.

- 1—McDougall 20" x 10', S.B.G., P.C.G. Engine Lathe.

- 1—Walcott 26" x 12', D.B.G., Q.C.G. Engine Lathe.

- 1—Walcott 20" x 10', D.B.G., Q.C.G., Engine Lathe.

- 1—Walcott 20" x 8', D.B.G., Q.C.G. Engine Lathe.

- 1—McDougall 18" x 8', D.B.G., Q.C.G. Engine Lathe.

- 2—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathes.

- 1—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathe, complete with pan bed and taper attachment.

- 1—Walcott 16" x 6', D.B.G., Q.C.G. Engine Lathe.

- 1—Walcott 14" x 6', D.B.G., Q.C.G. Engine Lathe.

- 1—Seneca Falls 12" x 6', Style E Tool Room Lathe, draw-in chuck, one collet, 1/4" taper attachment.

- 1—Seneca Falls 12" x 6', Style E Tool Room Lathe.

- 1—Seneca Falls 12" x 6', Style H Tool Room Lathe, pan bed.

- 1—Seneca Falls 11" x 5', Style E Tool Room Lathe, draw-in chuck, one collet, 1/4" taper attachment.

- 1—Seneca Falls 9" x 4', Tool Room Lathe with pedal attachment.

BALERS

- 1—Climax Hand Baler, No. 2, capacity bale 14 x 18 x 28.

BOLT MACHINES

- 1—No. 734 Wells Bolt Threading Machine with friction countershaft, cap. 1/4 to 2".

- 1—Landis 1 1/2" Single Head Threading Machine without chasers.

- 1—Landis 2" Single Head Threading Machine without chasers.

- 1—Landis 1 1/2" Double Head Threading Machine without chasers.

- 2—Landis 1" Bolt Cutter Heads without chasers.

- 2—Landis 1 1/2" Bolt Cutter Heads without chasers.

- 2—Landis 2" Bolt Cutter Heads without chasers.

- 1—1 1/4" Landis Automatic Screw Cutting Die Head without chasers.

- We have in stock large assortment chasers (About 345 Sets)

DRILLING MACHINES

- 2—No. 3 McDougall 20", B.G., Power Feed Drills, cap. 1 1/4".

- 2—No. 14 Perfect Column Drills, cap. 9/16" drills.

- 1—5/16" McKenzie Column Drill.

- 1—No. 18 Perfect Bench Drill, cap. 5/16" drills.

- 1—No. 15 Perfect Bench Drill, cap. 9/16" drills.

- 1—5/16" McKenzie Bench Drill.

- 1—No. 1 10" Burke Sensitive Drill, cap. 0 to 3/8".

- 2—Buffalo 10" Bench Drills, 9/16" capacity.

- 2—No. 28 Canedy Otto Sensitive Bench Drills, 0 to 1/2".

RADBORE DRILLING ATTACHMENT

- 1—No. 5, Milling Machine Type.

Continued on page 104

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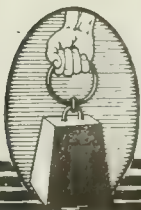
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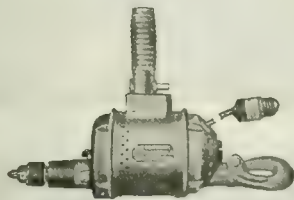
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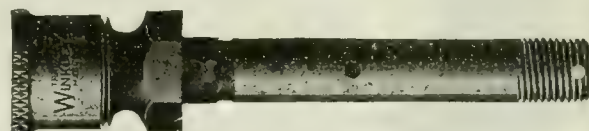
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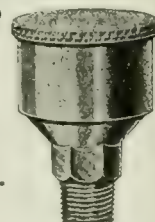
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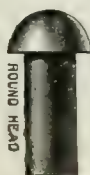
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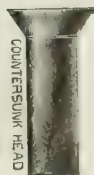
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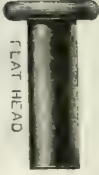
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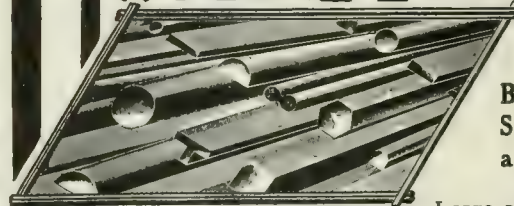
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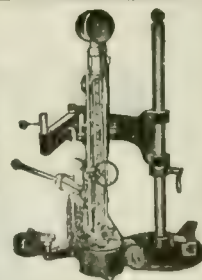
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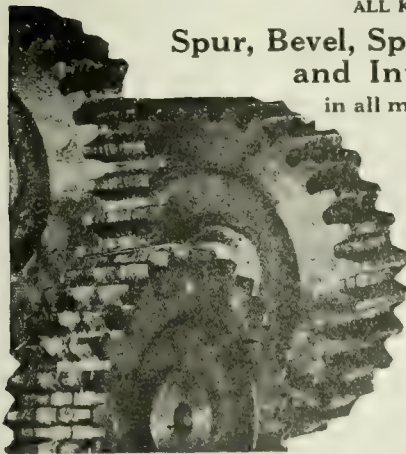
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"I am sorry, Grimley" — he came straight to the point—"but we are compelled to dis-
pense with your services at the end of the month. Turner's for the past six months has been having a terrible pull. We got overstocked on the rising market and now, with the market falling every day and getting more and more into the customers' hands, we have to retrench or crash. We have chosen to retrench. Every stick of decorative employment is being cut out of the store. . . ."

What Spectre? The Spectre of Unemployment—a spectre which all too many have encountered during the past few months. If you have not personally encountered this spectre, so graphically described in its causes and consequences by Guy Morton, you may count yourself amongst the fortunate, but there will be no doubt as to your interest in his story. If you have encountered it, nothing can stop you, once you start this story, from reading it to its unusual and constructive conclusion.

It is a great piece of fiction, told by the same author who wrote "Personality Plus" in the March 15th MACLEAN's.

Review of Reviews

Social Revolution in England

Sir Philip Gibbs

Can Germany Pay?...Stephane Lauzanne

Lighter Side of Diplomacy

Maurice Francis Egan

The African Lung Fish

Scientific American Monthly

Shock Cures Shock.....A Psycho-Analyst

Ten and a Half Dollar Novels

George Moore

Soil Subsidence in England....Daily Mail

MAY 1st ISSUE 20c.
NOW ON ALL NEWS-STANDS

MACLEAN'S
"CANADA'S NATIONAL MAGAZINE"

Ten Others

"The Drama of our Great Forests":

Life and Love Return—

By Arthur Heming

This is the seventh installment in Mr. Heming's wonderful account of life in our northern forests and pictures the fascination of real romance in the wilds.

"Have Faith in Our Nationals"—

By Agnes C. Laut

There is no use always knocking, says Miss Laut. By a constructive policy of immigration and settlement, some of these deficits can be vastly reduced.

"Conversation vs. Closure"—

By J. K. Munro

Premier Meighen is struggling against great odds to carry through some constructive legislation. According to Mr. Munro, they are really not getting anything done at Ottawa—and he tells how they do it in his masterly, pungent, pithy, witty fashion.

"She Wasn't a 'Type' So She Became a Directress"—

By Edith M. Cuppage

The story of a B.C. woman who wanted to get into the movies—and got there, despite everything, in the administrative side.

"Heads Million Dollar Corporation"—

By Dorothy G. Bell

The story of a Canadian girl who went to the States with an idea that she might become a dancer, but has made for herself a niche as head of a million dollar financial corporation.

"Our Own Mediterranean"—

By Elton Johnson

What's what at the present time in regard to the movement which is on foot to make ocean ports of our Great Lake ports.

"Making Good on Four Ambitions"—

By Sinclair Laird

The story of W. S. Bullock, a member of the Provincial Legislature of Quebec Province, who did not know his multiplication table at 19 and is now a leading educationalist.

"Pawned"—

By Frank L. Packard

This masterly story of a triple regeneration is drawing swiftly to its conclusion; John Bruce and Crang meet again at death-grips.

"The Gates of Tien T'ze"—

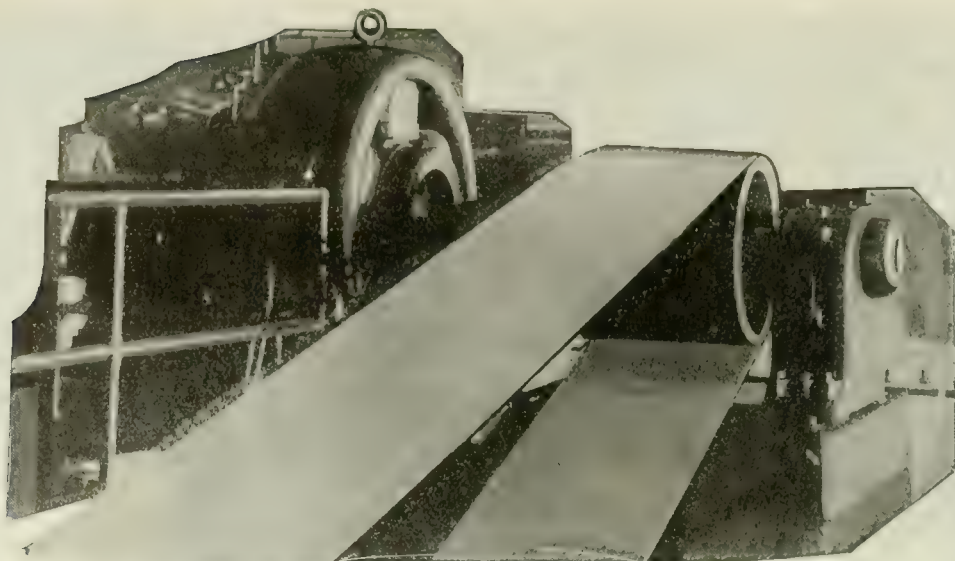
By Leslie Howard Gordon

The first "gate" is entitled "The Gate of Wu" and starts off this thrilling, absorbing, melodramatic story with several full pages of gripping adventure.

"The Cage of Iron"—

By William Merriman Rouse

A story of an old man who thought he could take into his own hands the vengeance which the Creator intended should be left for Himself.



Transmission Insurance

Are your drives insured against belt unreliability? Power economy in machine shops and power plants is gained only by transmission efficiency. The highest efficiency is reached with Dominion Rubber System Friction Surface Belting—properly installed—because it represents the skill and experience of the largest manufacturers in Canada.

One of our belting men, from our nearest Service Branch, will gladly inspect conditions in your plant and submit recommendations for your approval.

Dominion Rubber System Service Branches

Halifax
St. John
Quebec
Montreal

Ottawa
Toronto
Hamilton
London

Kitchener
North Bay
Fort William
Winnipeg

Brandon
Regina
Saskatoon
Edmonton

Calgary
Lethbridge
Vancouver
Victoria

DOMINION RUBBER SYSTEM PRODUCTS

Belting

Transmission: "Dominion," "Keewatin," "Para."
Conveyor: "Rockproof," "Canadian," "Hiheat"
Elevator: "Dominion," "Rockproof."
Agricultural: "Dominion," "Star."
Grain Elevator: "Metcalf Standard," "Grain King."

Hose

Air: "Kushion Kover," "4810 Airtite," "Star."
Steam: "Indestructible," "Rockproof," "Para."
Water: "Indestructible," "Para," "Kushion Kover," "Star."
Suction: "Para," "Star," "Trade."
Garden: "Canadian," "Dominion."

Packing

Sheet: "Join-Tite," "Star," "Importers."
Rod: "Cabestos," "Valve-Bestos," "Canadian."
Valves: "Montreal," "Commercial," "Canadian."

Miscellaneous

Mats, Matting and Flooring.
Moulded Goods.
Plumbers' Specialties.
Hard Rubber Goods, Tubing.
Rubber Covered Rolls, Deckle Straps.
Friction Tape, Splicing Compound.





Nichrome

the Casting Durable

Carbonizing Containers

of Cast Nichrome are at once a source of economy and an aid to quality results.

Since the very principle of carbonizing and hardening is one of quality and service, the reasons for the extensive use of Cast Nichrome Containers are obvious.

Thousands of hours of service, at 1,800 deg. F., without warping, growing, cracking or scaling means not only economy, but also uniformly good results in the heat-treated parts. Shorter heats, greater furnace capacity and less fuel are added advantages. All Cast Nichrome containers are backed up by the Cast Nichrome economy guarantee.

Manufactured under HENDERSON Patents by

CANADIAN DRIVER-HARRIS CO.

WALKERVILLE, ONT.

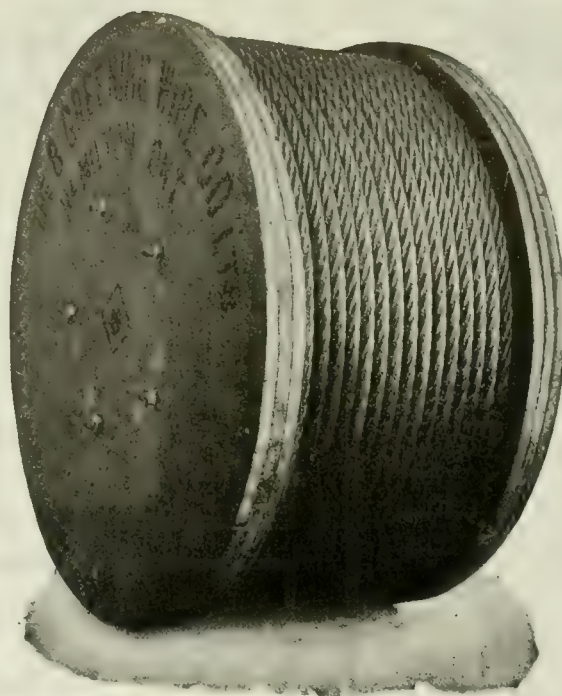
Chicago-Detroit

American Office and Works
Harrison, N. J.

England-France



WIRE ROPES



High-Grade

Quick Service

FOR

**HOISTING
HAULAGE
CABLEWAYS**

**DREDGES
STEAMSHOVELS
SHIPS' RIGGING**

Prices Promptly Quoted

The B. Greening Wire Co., Limited

Hamilton, Ont.

Montreal, Que.



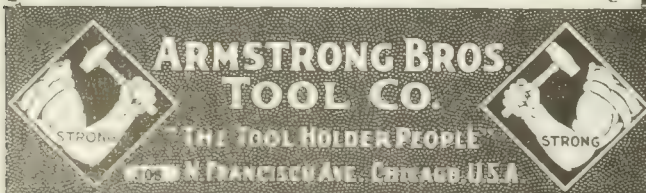
LEARNED From Experience

WHEN *ARMSTRONG* earned his living by *RUNNING A LATHE* he often wished he could get a set of Lathe Dogs which would stand up to the work. The Screws especially were a constant source of trouble, points upsetting and threads stripping.

His practical experience is the basis upon which the *Armstrong* line of Dogs and Clamps is built. The bodies are Drop Forged of a special grade of steel selected for its high degree of stiffness and great tensile strength. Screws can't be beat for long lasting qualities; they are made of Chrome-Nickel Steel, given a special heat treatment, and the points are hardened.

Specify Armstrong when ordering and get the best.

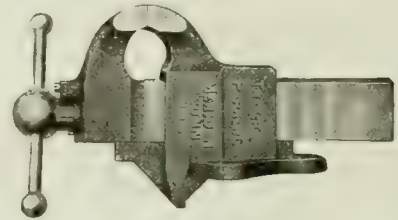
Catalog mailed free upon request.



PARKER VISES

Pioneers 1842

Leaders Ever Since



Parker Superior

Parker Superior says—

There are

7

reasons why our Branch of the Parker Family are demanded. Watch the next seven issues and learn.

The Charles Parker Company

Master Vise Makers

Meriden

Conn., U.S.A.



COLUMBIA PYRAMID BRUSHES FOR STREET CAR MOTORS

*Uniform
in Structure*

*Uniform
in Capacity*

*Uniform
in Size*

*Uniform
in Performance*

There is one BEST type of Columbia Pyramid Brush for YOUR motors. Let us put on exactly the brush you need.

CANADIAN NATIONAL CARBON COMPANY,
LIMITED
TORONTO AND WINNIPEG

TOOL GRINDING CHART

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send ^{me}_{us} free, one of your tool grinding charts.


Signed

Firm Name

St. Address

City

Prov.



**Built
for
Wear**

BUSHINGS

Diamond Fibre Bushings are especially adapted for use where toughness and ability to withstand hard usage are of paramount importance. They are made in every style: flanged, tapped, threaded, countersunk, tapered, or a combination of all these styles.

Diamond Fibre is particularly suited for use in the Automotive Industry because of its imperviousness to oil and grease, its high dielectric strength, its light weight and great strength, and the ease with which it takes extreme machining.

Some of the Many Uses Where Diamond Fibre has Proved Superior

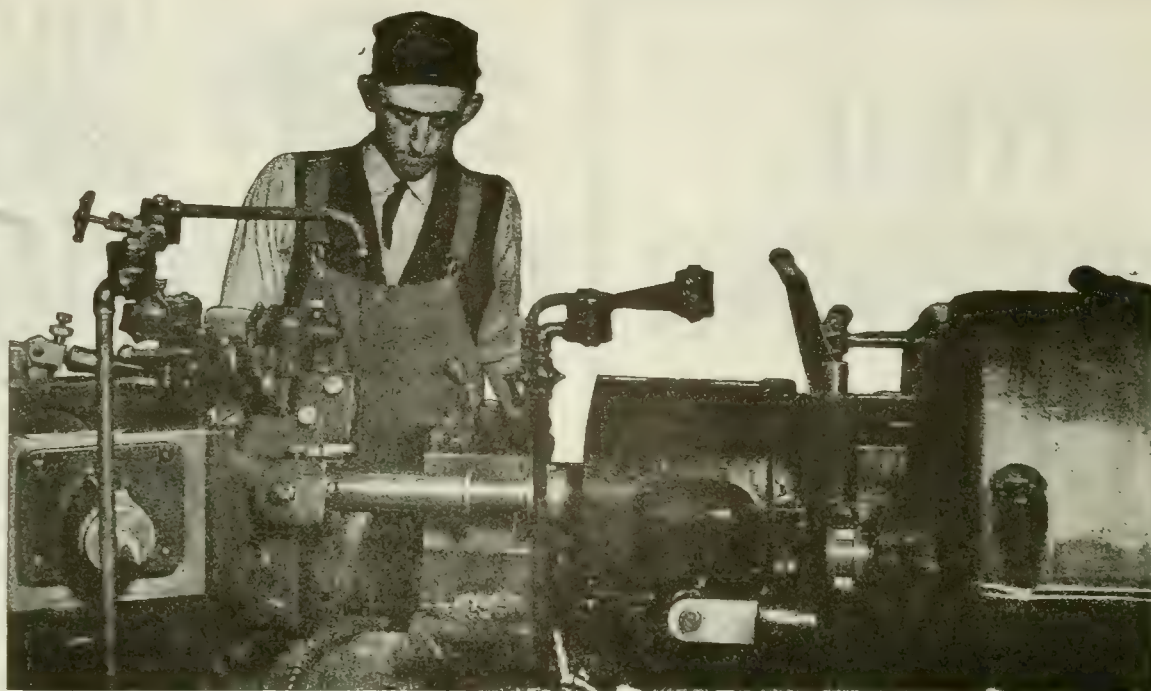
Battery box linings	Discs	Switch handles
Brake bands	Frictions	Timer rings
Bushings	Gaskets	Transmission handles
Bush rod tappets	Insulation	Washers
Clutch linings	Packings	Wire manifolds
Conduits for wiring	Speedometer gears	Parts for starting, lighting and ignition systems.
	Starting crank handles	

We are fully equipped to take care of special shapes made to your specifications for any article you desire, or can supply the basic material in sheets, tubes, or rods.

We will be glad to advise you on any production problem that is bothering you. Our engineers and experts are at your service. Send for our new illustrated catalogue about Diamond Fibre and its uses.

DIAMOND STATE FIBRE COMPANY OF CANADA LIMITED

Head Office and Works :
235 Carlaw Avenue - - - TORONTO, CANADA
MONTREAL BRANCH - - - 84 St. Francois Xavier St.



To Decrease Operating Costs

The side carriage is an important part of the W.&S. turret lathe. It reduces operating costs, often by as much as one-half. It operates simultaneously with the turret and independently of it. The side carriage has a separate feed rod.

Take some of the simplest bar jobs; by cutting off with the side carriage while the turret tools are finishing their work, you save most of the cutting off time.

Here is the picture of a W.&S. 2-A in a railroad shop. This machine makes bolts, pins, oil cups, valve

parts, piston rods, and many other parts used in the repair of locomotives and cars.

On all these parts both turrets operate together.

Take this feature and the fact that the machine operates easily and accurately, and you know why the machine is popular with the shop men. It delivers the goods.

Send us blue prints of your parts and we'll tell you how long it will take to do your work the W.&S. Way.

The Warner & Swasey Company Cleveland, U.S.A.

BRANCH SALES OFFICES:

NEW YORK: Singer Building.

CHICAGO: 618-622 Washington Boulevard.

BOSTON: Oliver Building.

BUFFALO: Iroquois Building.

DETROIT: 5928 Second Boulevard.

MILWAUKEE: 209 Sycamore Building

INDIANAPOLIS: 940 Lemcke Annex.

DAYTON: 518 Mutual Home Building.

CANADIAN AGENTS—

A. R. Williams Machinery Company, Ltd., Toronto, Winnipeg, Vancouver, St. John.

Williams & Wilson, Ltd., Montreal.

FOREIGN AGENTS—

Charles Churchill & Company, Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.

Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.

Wilhelm Sonesson Company, Malmo, Copenhagen, Stockholm, Gothenburg.

R. S. Stokvis en Zonen, Rotterdam.

Benson Brothers, Sydney, Melbourne, Adelaide.

Yamatake Company, Tokyo, Osaka, Nagoya, Fukuoka, Dairen.

McLeod & Company, Calcutta.

Andersen, Meyer & Company, Ltd., Shanghai.

Brossard-Mopin & Company, Saigon, Singapore, Haiphong.

MADE - IN - CANADA

Torrington

**MACHINE
SCREWS**

**Cut Down the
Work on Your
Screw Machines**

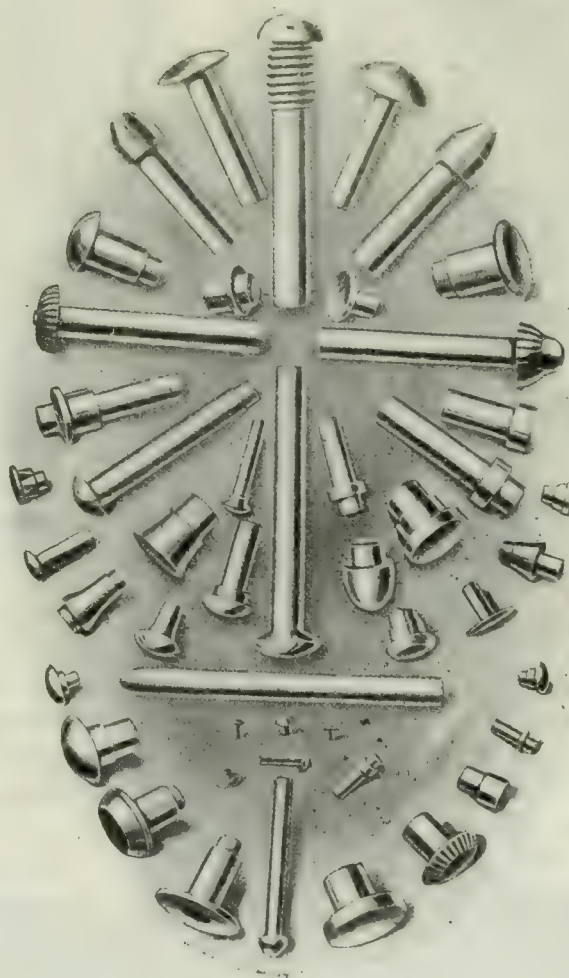
NATURALLY you want to reduce your manufacturing costs in every way you can.

A great many parts now made on screw machines can be produced by our process at a great saving in cost.

And back of every order sent to this company is an enviable reputation for products superior in quality and workmanship.

In addition to our standard line of machine screws we manufacture special sizes and styles to order when required.

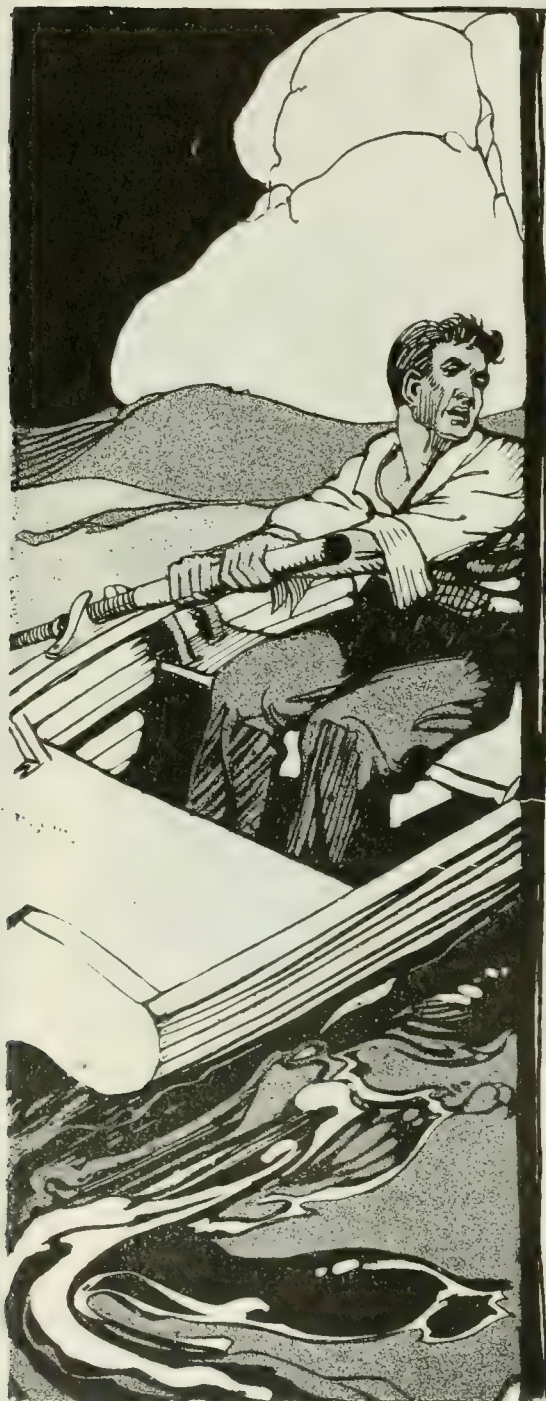
We also manufacture special parts, after the style herewith illustrated, upon receipt of samples. All kinds of high-grade Rivets, from Brass, Copper, Steel, German Silver and Aluminum—to order only.



**These are but a few of the many
parts we frequently make.**

THE TORRINGTON COMPANY, LIMITED
UPPER BEDFORD, QUEBEC

You Can't Row a Boat with One Oar



An unbalanced advertising campaign, like a one-oar boat, never gets anywhere.

Sound copy must be balanced by scientific space selection. Mediums deserve as much attention as merchandising.

To buy space scientifically circulation must be *analyzed*—not merely counted.

Do you ask of a publication not only "How much?" but also "How did you get it?" and "Where does it go?" If you fail in these particulars you are trying to make an advertising campaign go with only one oar.

The answers to these questions can be obtained by studying the A. B. C. reports. To read the circulation figures only is not enough, even though they are verified by the A. B. C. audit. This is but the beginning.

Advertising is being put to a test to-day, which it can meet if you put circulation to the test of A. B. C. reports.

Canadian Machinery is a member of The Audit Bureau of Circulations.

The MacLean Publishing Co., Limited, Toronto

EIGHT BRANCH OFFICES

Trahern Pumps

On Springfield Tools

Here is one of the huge machines, manufactured by the Springfield Machine Tool Co. of Springfield, Ohio.

Two TRAHERN Pumps are used on this machine. The smallest pump draws oil from reservoir under headstock and distributes to bearings. Oil then passes through special strainer and is pumped by the larger pump under 80 lbs. pressure to the tools. There could hardly be a more efficient or economical installation. TRAHERN Pumps are Rotary Geared, operate at low speed giving long life, have large capacity, forceful, non-pulsating streams against high pressure. They will supply coolant to one or a battery of machines.

Let us send a sample pump for trial in your plant

TRAHERN PUMP DIVISION
Geo. D. Roper Corporation
Rockford, Ill.



STEEL *for* Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

**Nova Scotia
Steel and Coal
Co., Limited**

Head Offices:
New Glasgow, N.S.

Sales Offices:
Room 14 Windsor Hotel
MONTREAL

Steel Ingots
by the

HARMET

Liquid Process





Name of Hardware Merchant and further details, supplied upon request

The Answer is—He Didn't !

THE crowd was drawn by a hardware firm in an Ontario town of 700 population. This crowd of over 1,000 people represents customers of the store, drawn from miles around, to attend the picnic given by this firm to its customers. Surely this is evidence of the close relationship between this hardware firm and its customers.

The close relationship between retailer and customer in this instance is typical of conditions existing in hundreds of Canadian towns, villages and cities.

The average hardware merchant (particularly in the smaller cities and towns) has been established for many years. He has a big business connection built up through years of efficient service to his customers. He is well rated, and a desirable man with whom to do business. He influences the buying habits of the people in his community, and in over 90% of the sales made, he is the deciding factor.

"Which one do you recommend?" is a question asked thousands of times each day in the hardware stores of Canada.

If you can get the effort and enthusiasm of the retail hardware merchants and their clerks, plus their window and interior displays and local advertising behind your goods, you will have secured the co-operation of one of the greatest available selling forces.

HARDWARE AND METAL is paid for, and read, by all the wholesale hardware buyers of Canada, and over 90% of the retailers from coast to coast. They are the men who control the sale of your products to the hardware consumers. HARDWARE AND METAL can put your story before, practically, the entire Canadian hardware trade. One of our representatives would be glad to give further details.

(Only hardware paper in Canada with membership in the Audit Bureau of Circulations).

HARDWARE & METAL

Canada's National Hardware Weekly since 1888

143-153 University Avenue

Toronto, Canada

Published every Saturday since 1888. The only weekly hardware paper in Canada, and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations

Montreal Branch, Southam Building

Winnipeg Branch, Union Trust Building

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



No. 4

Darn Few Blind
Men Pay an
Income Tax

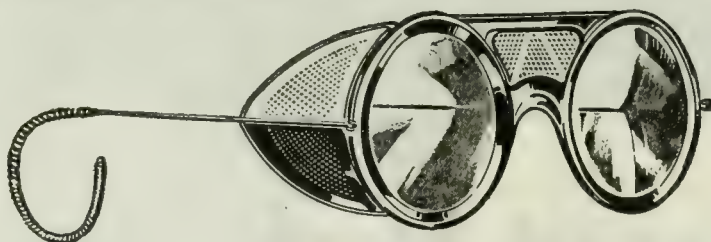
Wear your Goggles!

This is No. 4 of a series of short paragraphs which is appearing regularly in our advertising. Permission is freely given Safety Engineers, Editors of Employees' Magazines, and others to use this material as they wish. In addition, we shall be glad to furnish these paragraphs in leaflet form, in any quantity, for insertion in pay envelopes or as posters for bulletin use.

Operators on Grinding Wheels Need

STOCO SAFETY GOGGLES
(Pat. Dec. 12, 1916)
with

"CELOGLAS" Shatter-Proof Lenses



The **Stoco** Safety Goggle has a broad, smooth surface bearing on the nose, which comfortably distributes the weight of the glass over a wide area instead of concentrating it on the sensitive bridge of the nose. That is one of the several reasons why men who must have continuous eye protection favor the **Stoco** Safety Goggle.

The **Stoco** Safety Goggle.

Price each (f.o.b. Geneva, N.Y.)

With "Celoglas" Shatter-Proof
Lenses\$1.15

With Optical Glass Lenses90

Attractive Discounts for Quantity
Orders.

Comfortable earbows or black elastic
headbands at the same price.

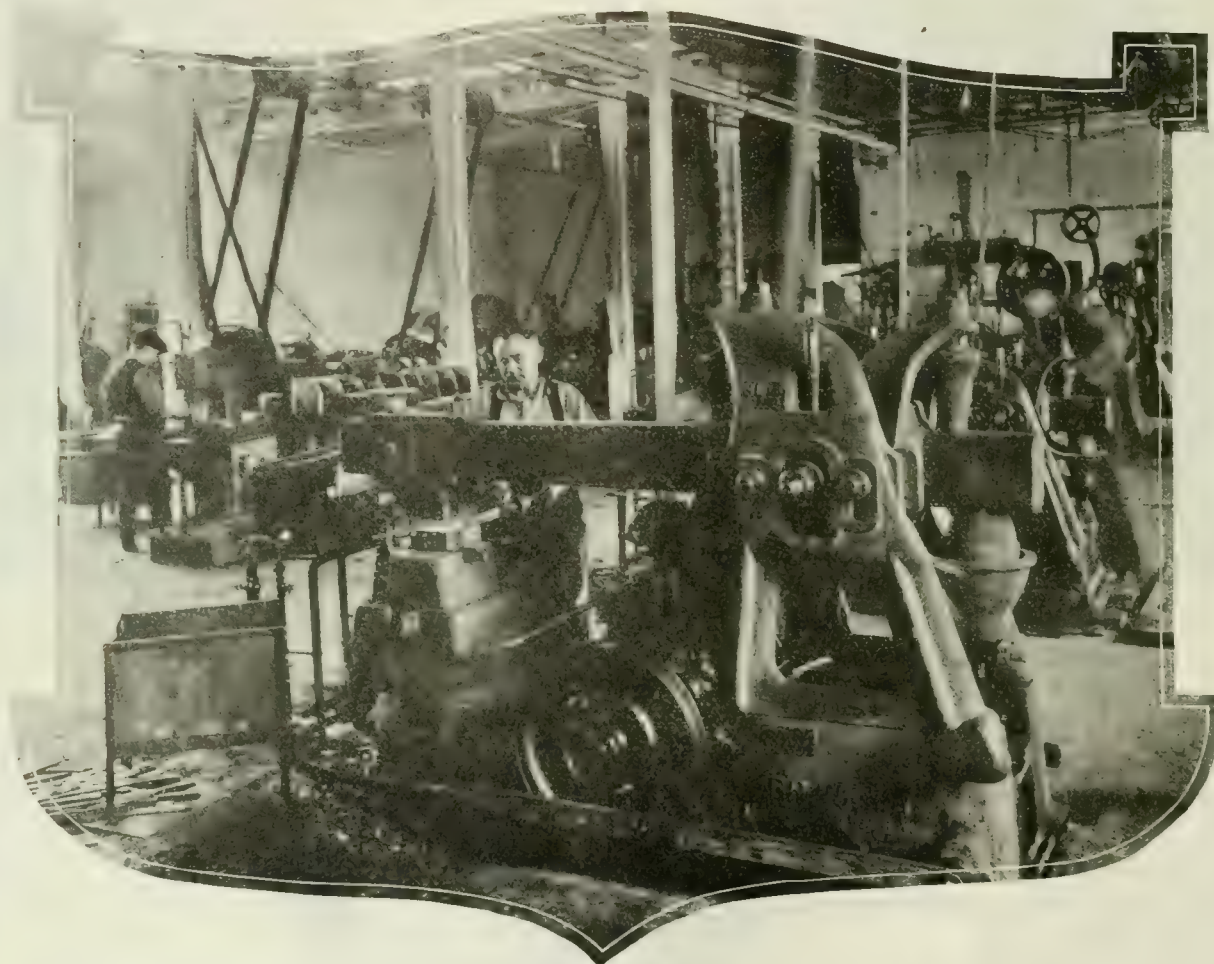
NOTE.—A sample **Stoco** Safety
Goggle will be sent interested, respon-
sible people on receipt of request on
letterhead.

THE STANDARD OPTICAL CO. GENEVA N.Y.

If interested tear out this page and place with letters to be answered.

BRADLEY HAMMERS

If it's a hammer job—"*Forge ahead with a Bradley*"



Bradleys at Work

There is a complete battery of Bradley Hammers at work pointing files for the Ingersoll File Company, Ingersoll, Ontario. Each is "forging ahead" with the usual Bradley efficiency.

Bradley Hammers fit into almost any production scheme. Their simple, sensitive, one-man control permits a wide choice in force and speed, making them adaptable to a wide variety of operations on a broad range of work.

Let us tell you all about them.

C. C. BRADLEY & SON, INC.
Syracuse, N.Y., U.S.A.

FOREIGN AGENTS: England, Buck & Hickman, Ltd., London; France, Fenwick Freres & Co., Lyons, Rhone; Italy, Fenwick Freres & Co., Turin; Belgium, Fenwick Freres & Co., Liege; Brazil, Fenwick Freres & Co., Rio de Janeiro; Switzerland, Fenwick Freres & Co., Zurich; Portugal, Fen-

wick & Co., Lisbon; Spain, Fenwick Freres & Co., Barcelona; Alsace-Lorraine, Fenwick Freres & Co., Luxembourg; China, Anderson Meyer & Co., Ltd., Shanghai; Norway, Sweden, Denmark, Chr. A. Herstad, Copenhagen, Denmark.



WHEN a young fellow comes to me for advice on what tools to buy, I tell him

Starrett Tools

"I've found that Starrett Tools are easiest to use. Every adjustment is made simple and positive.

"When you've got a complete kit of Starrett Tools, you feel that you're ready for any job that comes along. That's a good feeling to have. It gives you confidence.

"And keep your weather eye out for new Starrett Tools.

"If you want to keep on improving your work, you'll need to keep on improving your tool kit.

"Round out your Starrett Tool outfit—ask the hardware dealer what's new.

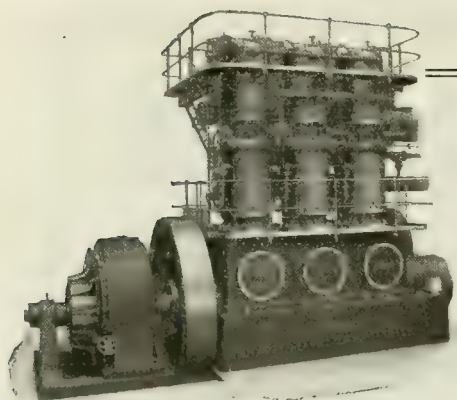
"The Starrett Catalog No. 22 is a book every mechanic should have around. Write for it now."

THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.



Starrett Tools



Vertical Tandem Gas Engines.
300 to 2000 B.H.P.

WE MANUFACTURE

GAS ENGINES

OIL ENGINES

SUCTION GAS PLANTS

and having dealt exclusively with this class of work, we
are able to offer engines unsurpassed for reliability and economy.

NATIONAL

Our productions are in use in all parts of the world, and are the embodiment of

EXCELLENT WORKMANSHIP

FIRST-CLASS MATERIAL

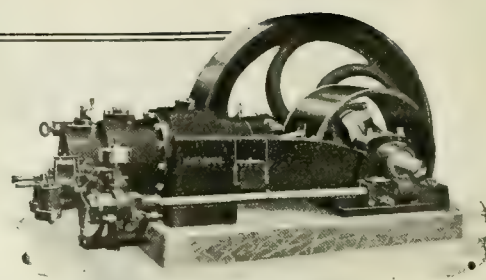
SOUND DESIGN

We solicit your enquiries

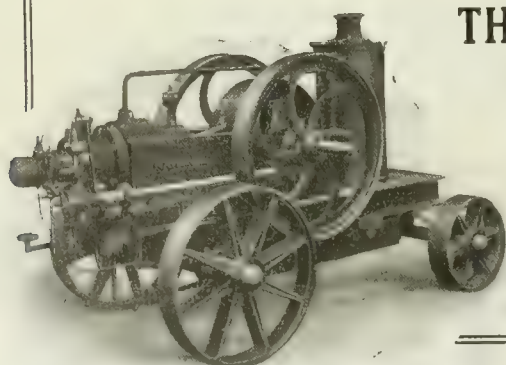
**THE NATIONAL GAS
ENGINE CO., LTD.**

ASHTON-UNDER-LYNE

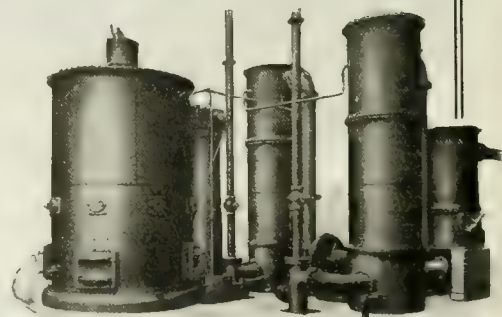
ENGLAND



Standard Mill Engine.
150 B.H.P.



Portable Oil Engines.
3 to 35 B.H.P.



Standard Suction Gas Plant.
300 B.H.P.

D. K. McLaren's Leather Belting



Look for the Oak Leaf

BACK LEATHERS—This is the best portion of the hide for belting purposes. Every inch of D. K. McLaren Belts represents Flawless Backs of the hides of the choicest steers.

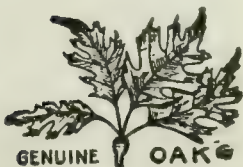
BRITISH-OAK-TANNED — The most approved process known for preparing belts for hard service. Every bit of the hide's natural strength is preserved in D. K. McLaren's belts by the expert use of this famous process.

Back of the D. K. McLaren Oak Leaf is a tangible prestige.

The years we have expended in building a reputation for D. K. McLaren's Belting, have not been wasted.

By building every belt to the best of our ability and thoroughly testing every inch of it before stamping it with the Oak Leaf, more and more firms are coming to realize that the D. K. McLaren trade mark is a guarantee of unfailing quality.

We shall be glad to send you a list of prominent customers of ours which will convince **you**. Shall we?



D·K·M·LAREN
LIMITED



HEAD OFFICE AND FACTORY:

351 ST. JAMES ST., MONTREAL, P.Q., CANADA

TORONTO, ONT.
194 King St. West

ST. JOHN, N.B.
90 Germain St.

VANCOUVER, B.C.
334 Cordova St. W.

Canadian Machinery Buyers Directory

If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

Abrasive Discs

Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng.

Abrasive Materials

Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Acetylene, Dissolved

L'Air Liquide Society, Toronto, Ont.

Accumulators, Hydraulic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Air Lifts

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

Analyses, Chemical

Toronto Testing Laboratory, Toronto, Ont.

Angle Bars

Steel Co. of Canada, Ltd., Hamilton, Ont.

Anvils

Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdw. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

Arbors

Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

Axles, Car

Dom. Foundries & Steel, Hamilton, Ont.

Rabbit Metal

Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.

Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoy Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

Balls, Brass, Bronze and Steel

Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Barrels, Tumbling

McDougall Co., Ltd., R., Galt, Ont.

Bars, Boring

Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

Bars, Boring, Portable

Underwood Corp., H. B., Philadelphia, Pa.

Bars, Bronze Cored

Moore & Son, Thos., Montreal, Que.

Bars, Iron

Steel Co. of Canada, Ltd., Hamilton, Ont.

Bars, Steel

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Vanadium Alloy Steel Corp., Canton, Ohio
Vanadium Alloys Steel, Latrobe, Pa.

Bearings, Ball

Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lahm Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Bronze

Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Die-Cast

Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Journal

Fisher Motor Co., Ltd., Orillia, Ont.

Bearings, Roller

Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Belt Cement

McLaren Belting Co., J. C., Montreal, Que.

Belt Dressings and Fillers

Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'g'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Fasteners

Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'g'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Belt Hooks

Torrington Co., Ltd., Upper Bedford, Que.

Belt Lacing

Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'g'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Lacing, Steel

Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Hinged

Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Flexible Steel

Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing Machines

Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'g'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Belt Joiners, Conveyor

Flexible Steel Lacing Co., Chicago, Ill.

Belt Tools

Graton & Knight Mfg. Co., Worcester, Mass.

Belting, Chain

Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Belting, Fabric

Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'g'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

Belting, Leather

Atkins & Co., Inc., E. C., Indianapolis, I.

Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'g'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

McLaren Belting Co., J. C., Montreal, Que.

Smith Belting Co., Toronto, Ont.

Sumner & Co., New York City.

Tullis & Son, Ltd., John, Glasgow, Scot.

Belting, Rubber

Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

Belts, Abrasive

Federal Eng'g'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

Bench Countershaft Standards

Fori-Smith Machine Co., Hamilton, Ont.

Benches, Work

Aikenhead Hardware Ltd., Toronto, Ont.

Bending Machines, Power

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Rogers & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Bins, Ore

MacKinnon Steel Co., Sherbrooke, Que.

Blocks

Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Chain (See Hoists, Hand)

Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Blocks, Die

Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

Blocks, Pillow

Can. Link-Belt Co., Toronto, Ont.

Blowers

Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Bolt and Nut Machinery

Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

Bolt and Nut Machinery, Automatic

National Acme Co., Cleveland, Ohio.

Bolts and Nuts

London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bolt Threading Die Heads

Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Boosters

Sturtevant Co., B. F., Boston, Mass.

Boring and Turning Mills, Vertical

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

Boring, Drilling and Milling Machines, Horizontal

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

Boring, Drilling and Milling Mach., Vertical

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads

Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

Brakes, Magnetic (for electric furnaces)

Volta Mfg. Co., Welland, Ont.

Brass

Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bricks, Fire

Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

Bridges

Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

Broaching Machines

Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mch. Co., Toronto, Ont.

Bronze

Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Waukegan, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bronze, Phosphor

British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bucket Carriers, Pivoted

Can. Link-Belt Co., Toronto, Ont.

Buffing or Polishing Machines (See Polishing and Buffing Machines)

Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

Bulldozers

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.

Burners, Oil and Gas

General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

Bushings

Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Cabinets, Oil

S. F. Bowser & Co., Ltd., Toronto, Ont.

Calipers

Brown & Sharpe Mfg. Co., Providence, R.I.

Cams

Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery)

Riles Co., E. W., Brooklyn, N.Y.
Brown, Rogers & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

For list of Dealers see the last page of This Buyers' Directory

BUYERS DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum

Canada Electric Castings Co., Ltd., Orillia, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.

Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Brass and Bronze

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.

Canada Electric Castings Co., Ltd., Orillia, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.

Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.

Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper

Can. Hanson & Van Winkle Co., Toronto, Ont.

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine

Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Castings, Die Molded

Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy

Can. Steel Foundries, Montreal, Que.

Castings, Iron

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.

Bernard Industrial Co., A., Fortierville, Que.

Bilton Machine Co., Bridgeport, Conn.

Brown, Boggs & Co., Ltd., Hamilton, Ont.

Can. Hanson & Van Winkle Co., Toronto, Ont.

Canada Electric Castings Co., Ltd., Orillia, Ont.

Hanna & Co., M. A., Cleveland, Ohio.

Hepburn Ltd., John T., Toronto, Ont.

Katie Foundry Co., Galt, Ont.

Kennedy & Sons, Wm., Owen Sound, Ont.

McDougall Co., Ltd., R., Galt, Ont.

Victoria Foundry Co., Ltd., Ottawa, Ont.

Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press

Can. Steel Foundries, Montreal, Que.

Castings, Monel Metal

Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome

Can. Driver-Harris Co., Walkerville, Ont.

Castings, Nickel

Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel

Davidson Mfg. Co., Thos., Montreal, Que.

Hull Iron & Steel Foundries, Hull, Que.

Katie Foundry Co., Galt, Ont.

Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel

Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Can. Steel Foundries, Montreal, Que.

Kennedy & Sons, Wm., Owen Sound, Ont.

Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron

Smooth Mfg. Co., Jersey City, N.J.

Centering Machines

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Chains (See Sprockets and Chains)

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Morse Chain Co., Ithaca, N.Y.

Philadelphia Gear Works, Philadelphia, Pa.

Renold (Hans) of Canada, Ltd., Montreal, Que.

Wright Mfg. Co., Lisbon, Ohio.

Chains, Driving

Can. Link-Belt Co., Toronto, Ont.

Greenfield Tap & Die Corp., Galt, Ont.

Jones & Glasco, Montreal, Que.

Morse Chain Co., Ithaca, N.Y.

Renold (Hans) of Canada, Ltd., Montreal, Que.

Wright Mfg. Co., Lisbon, Ohio.

Chasers

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Jones & Lamson Machine Co., Springfield, Vt.

Landis Machine Co., Inc., Waynesboro, Pa.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists

Toronto Testing Laboratory, Toronto, Ont.

Chucking Machines

Acme Machine Tool Co., Cincinnati, Ohio

Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Steinle Turbine Machine Co., Madison, Wis.

Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill

Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap

Aikenhead Hardware Ltd., Toronto, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal, Can.

Canadian SKF Co., Toronto, Ont.

Cushman Chuck Co., Hartford, Conn.

Dom. Steel Products Co., Brantford, Ont.

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Skinner Chuck Co., New Britain, Conn.

Union Mfg. Co., New Britain, Conn.

Williams & Wilson, Ltd., Montreal, Que.

Chucks, Lathes

Aikenhead Hardware Ltd., Toronto, Ont.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal, Can.

Cushman Chuck Co., Hartford, Conn.

Dom. Steel Products Co., Brantford, Ont.

Foss Machinery & Supply Co., Geo. F., Montreal, Que.

Geometric Tool Co., New Haven, Conn.

Gisholt Machine Co., Madison, Wis.

Ker & Goodwin Machine Co., Brantford, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Skinner Chuck Co., New Britain, Conn.

Union Mfg. Co., New Britain, Conn.

Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Cushman Chuck Co., Hartford, Conn.

Skinner Chuck Co., New Britain, Conn.

Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Gisholt Machine Co., Madison, Wis.

Skinner Chuck Co., New Britain, Conn.

Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'

Columbia Hdw. Division, Cleveland, O.

Dickow, Fred C., Chicago, Ill.

Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General

Oakley Chemical Co., New York, N.Y.

Clocks, Time

Gisholt Machine Co., Madison, Wis.

International Business Machines Co., Toronto, Ont.

Clutches, Friction

Bernard Industrial Co., A., Fortierville, Que.

Can. Link-Belt Co., Toronto, Ont.

Ford-Smith Machine Co., Hamilton, Ont.

Johnson Machine Co., Carlyle, Manchester, Conn.

Positive Clutch & Pulley Works, Toronto, Ont.

Coal and Ash Handling Machinery

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Can. Link-Belt Co., Toronto, Ont.

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems

Can. Link-Belt Co., Toronto, Ont.

Collars, Shaft or Set

Canada Foundries & Forgings Co., Welland, Ont.

Can. Link-Belt Co., Toronto, Ont.

Collets

Ackworth, Ltd., John, Birmingham, Eng.

Butterfield & Co., Inc., Rock Island, Que.

Canada Machinery Corp., Galt, Ont.

Hendey Machine Co., Torrington, Conn.

Kearney & Trecker Co., Milwaukee, Wis.

Petrie, Ltd., H. W., Toronto, Ont.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering

Catacrat Refining Co., Toronto, Ont.

Compounds, Cleaning

Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.

Oakley Chemical Co., New York, N.Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting

Atkins & Co., Inc., E. C., Indianapolis, I.

Catacrat Refining Co., Toronto, Ont.

Oakley Chemical Co., New York, N.Y.

Compressors, Air

Curtis Pneumatic Machinery Co., St. Louis, Mo.

Compressors, Air and Gas

Can. Fairbanks-Morse Co., Ltd., Montreal, Can.

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Garlock-Walker Mch. Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.

Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction

Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps

Canada Foundries & Forgings Co., Welland, Ont.

Contract Work

Ford-Smith Machine Co., Hamilton, Ont.

Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)

Jones & Glasco, Montreal, Que.

Main Belting Co. of Can., Montreal, Que.

Mathews Gravity Carrier Co., Port Hope, Ont.

Conveyor Belt Joiners

Flexible Steel Lacing Co., Chicago, Ill.

Copper

Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Counterbores

Cleveland Twist Drill Co., Cleveland, O.

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution

Aikenhead Hardware Ltd., Toronto, Ont.

Starrett Co., L. S., Athol, Mass.

Countershafts

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Canada Foundries & Forgings Co., Welland, Ont.

Ford-Smith Machine Co., Hamilton, Ont.

Johnson Machine Co., Carlyle, Manchester, Conn.

Kempsmith Mfg. Co., Milwaukee, Wis.

McDougall Co., Ltd., R., Galt, Ont.

Countersinks

Butterfield & Co., Inc., Rock Island, Que.

Eclipse Counterbore Co., Ltd., Walkerville, Ont.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive

Can. Steel Foundries, Montreal, Que.

Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Couplings, Flexible

Holden Co., Ltd., Montreal, Que.

Couplings, Rigid

Bernard Industrial Co., A., Fortierville, Que.

Couplings, Shaft

Bilton Machine Co., Bridgeport, Conn.

Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Can. Link-Belt Co., Toronto, Ont.

Dominion Bridge Co., Ltd., Lachine, Que.

Hepburn Ltd., John T., Toronto, Ont.

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

North Crane Works, Walkerville, Ont.

Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

Cranes, Hand (See Hoists, Hand)

Dominion Bridge Co., Ltd., Lachine, Que.

Hepburn Ltd., John T., Toronto, Ont.

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

North Crane Works, Walkerville, Ont.

Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive

Can. Link-Belt Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.

Cranes, Traveling

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Can. Link-Belt Co., Toronto, Ont.

Dominion Bridge Co., Ltd., Lachine, Que.

Hepburn Ltd., John T., Toronto, Ont.

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

North Crane Works, Walkerville, Ont.

Crank Pin Turning Machines

Garlock-Walker Mch. Co., Toronto, Ont.

Herbert Ltd., Alfred, Toronto, Ont.

Underwood Corp., H. B., Philadelphia, Pa.

Cutters, Flue

Holden Co., Ltd., Montreal, Que.

Cutters, Gear

BUYERS' DIRECTORY

Dies, Forging

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co. Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer

Kimber & Hillier, St. Catharines, Ont.

Dies, Self-Opening, Adjustable

Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murphy Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening

Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murphy Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Disc Cement

Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Dividing Heads

Ackworth, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendy Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Dogs, Lathe and Milling Machine

Armstrong Bros. Tool Co., Chicago, Ill.

Drafting Boards and Tables

Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Drafting Materials

American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Dressers, Grinding Wheel

Dom Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy Co., Grand Rapids, Mich.

Drill Holders

Armstrong Bros. Tool Co., Chicago, Ill.

Drill Rods

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders

Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads

Henry & Wright Mfg. Co., Hartford, Conn.
Hofer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic

Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench

Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Terry & Co., John C., Birmingham, Eng.

U.S. Electrical Tool Co., Cincinnati, O.

Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand

Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.

Garlock-Walker Mch. Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.

Independent Pneumatic Tool, Chicago, Ill.

Jardine & Co., A. B., Hespeler, Ont.

Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang

Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mch. Co., Toronto, Ont.
Hofer Mfg. Co., Freeport, Ill.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Canada Machinery Corp., Galt, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Hoosier Drilling Mach. Co., Goshen, Ind.

Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Canada Machinery Corp., Galt, Ont.

Gisholt Machine Co., Madison, Wis.

Holly, R. S., Toronto, Ont.

Rockford Drilling Machine Co., Rockford, Ill.

Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Multiple Spindle

Beacon Engineering Co., Tipton, England.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Bilton Machine Co., Bridgeport, Conn.

Henry & Wright Mfg. Co., Hartford, Conn.

Hofer Mfg. Co., Freeport, Ill.

National Acme Co., Cleveland, Ohio.

National Automatic Tool Co., Richmond, Ind.

Terry & Co., John C., Birmingham, Eng.

Drilling Machines, Pneumatic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Cleveland Pneumatic Tool Co., Toronto, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.

Independent Pneumatic Tool, Chicago, Ill.

Drilling Machines, Portable

Holden Co., Ltd., Montreal, Que.

Independent Pneumatic Tool, Chicago, Ill.

Jardine & Co., A. B., Hespeler, Ont.

Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Canada Machinery Corp., Galt, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Foss Machinery & Supply Co., Geo. F., Montreal, Que.

Garlock-Walker Mch. Co., Toronto, Ont.

Henry & Wright Mfg. Co., Hartford, Conn.

Herbert Ltd., Alfred, Toronto, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Williams Machinery Co., A. R., Toronto, Ont.

Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive

Beacon Engineering Co., Tipton, England.

Bilton Machine Co., Bridgeport, Conn.

Henry & Wright Mfg. Co., Hartford, Conn.

Herbert Ltd., Alfred, Toronto, Ont.

Hoosier Drilling Mach. Co., Goshen, Ind.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Rockford Drilling Machine Co., Rockford, Ill.

Terry & Co., John C., Birmingham, Eng.

United States Machine Tool Co., Cincinnati, Ohio.

Williams Machinery Co., A. R., Toronto, Ont.

Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret

Gisholt Machine Co., Madison, Wis.

Sensitive Turret Machine Co., Madison, Wis.

Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical

Aurora Tool Works, Aurora, Ind.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Canada Machinery Corp., Galt, Ont.

Can. Blower & Forge Co., Ltd., Kitchener.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Garlock-Walker Mch. Co., Toronto, Ont.

Herbert Ltd., Alfred, Toronto, Ont.

Hofer Mfg. Co., Freeport, Ill.

Hoosier Drilling Mach. Co., Goshen, Ind.

McDougal Co., Ltd., R. Galt, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Rockford Drilling Machine Co., Rockford, Ill.

Rockford Lathe & Drill Co., Rockford, Ill.

Perfect Machine Co., Ltd., Galt, Ont.

Terry & Co., John C., Birmingham, Eng.

Windsor Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center

Butterfield & Co., Inc., Rock Island, Que.

Cleveland Twist Drill Co., Cleveland, O.

Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drills, High Speed Twist

Armstrong-Whitworth Co. of Can., Ltd., Montreal, Que.

Butterfield & Co., Inc., Rock Island, Que.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Cleveland Twist Drill Co., Cleveland, O.

Can. Detroit Twist Drill Co., Walkerville, Ont.

Foss Machinery & Supply Co., Geo. F., Montreal, Que.

Garlock-Walker Mch. Co., Toronto, Ont.

Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.

Lyman Tube & Supply Co., Montreal, Que.

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Pilot Steel & Tool Co., Montreal, Que.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Sheffield Engineering Supplies, Ltd., Montreal, Que.

Sheffield Twist Drill & Steel Co., Sheffield, Eng.

Drills, Ratchet

Armstrong Bros. Tool Co., Chicago, Ill.

Butterfield & Co., Inc., Rock Island, Que.

Cleveland Twist Drill Co., Cleveland, O.

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat

Butterfield & Co., Inc., Rock Island, Que.

Cleveland Twist Drill Co., Cleveland, O.

Can. Detroit Twist Drill Co., Walkerville, Ont.

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Pilot Steel & Tool Co., Montreal, Que.

Dust Handling Equipment

Can. Blower & Forge Co., Ltd., Kitchener.

Shiner Bros. Mfg. Co., Inc., St. Louis, Mo.

Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments

Bristol Co., Waterbury, Conn.

Northern Electric Co., Montreal, Que.

Electrical Supplies

Atkins & Co., Inc., E. C., Indianapolis, I.

Diamond State Fibre Co., Toronto, Ont.

Northern Electric Co., Montreal, Que.

U.S. Electrical Tool Co., Cincinnati, O.

Elevating Trucks (See Trucks)

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors

Can. Link-Belt Co., Toronto, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Jones & Glasco, Montreal, Que.

Lyman Tube & Supply Co., Montreal, Que.

Main Belting Co. of Can., Montreal, Que.

Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Wheels (See Grinding Wheels)

Aikenhead Hardware Ltd., Toronto, Ont.

Atkins & Co., Inc., E. C., Indianapolis, I.

Can. Hart Products, Ltd., Hamilton, Ont.

Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.

Ford-Smith Machine Co., Hamilton, Ont.

Norton Co. of Can., Ltd., Hamilton, Ont.

Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Engines, Capstan

Kennedy & Sons, Wm., Owen Sound, Ont.

Engines, Mechanical

Ford-Smith Machine Co., Hamilton, Ont.

Gisholt Machine Co., Madison, Wis.

Hamilton Gear & Machine Co., Toronto, Ont.

Perdue, W. B., San Francisco, Calif.

Expanders, Tube

Garlock-Walker Mch. Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.

Jardine & Co., A. B., Hespeler, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Eye-glasses, Safety (See Goggles, Safety)

Prest-O-Lite Co. of Can., Toronto, Ont.

Willson Goggles, Inc., Reading, Pa.

Fans, Electric

Can. Blower & Forge Co., Ltd., Kitchener.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Northern Electric Co., Montreal, Que.

Shiner Bros. Mfg. Co., Inc., St. Louis, Mo.

Sturtevant Co., B. F., Boston, Mass.

Fans, Exhaust

Can. Blower & Forge Co., Ltd., Kitchener.

Petrie, Ltd., H. W., Toronto, Ont.

Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

Sturtevant Co., B. F., Boston, Mass.

Fans, Ventilating

Can. Blower & Forge Co., Ltd., Kitchener.

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Petrie, Ltd., H. W., Toronto, Ont.

Shiner Bros. Mfg. Co., Inc., St. Louis, Mo.

Sturtevant Co., B. F., Boston, Mass.

Fibre

Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Northern Electric Co., Montreal, Que.

File Handles

Ingersoll File Co., Ltd., Ingersoll, Ont.

Files and Rasps

Atkins & Co., Inc., E. C., Indianapolis, I.

Foss Machinery & Supply Co., Geo. F., Montreal, Que.

Ingersoll File Co., Ltd., Ingersoll, Ont.

Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Nicholson File Co., Port Hope, Ont.

Simonds Canada Saw Co., Montreal, Que.

Filing Machines

Garlock-Walker Mch. Co., Toronto, Ont.

Oliver Machinery Co., Grand Rapids, Mich.

Williams Machinery & Supply Co., A. R., Montreal, Que.

Filler, Iron (See Cements, Iron)

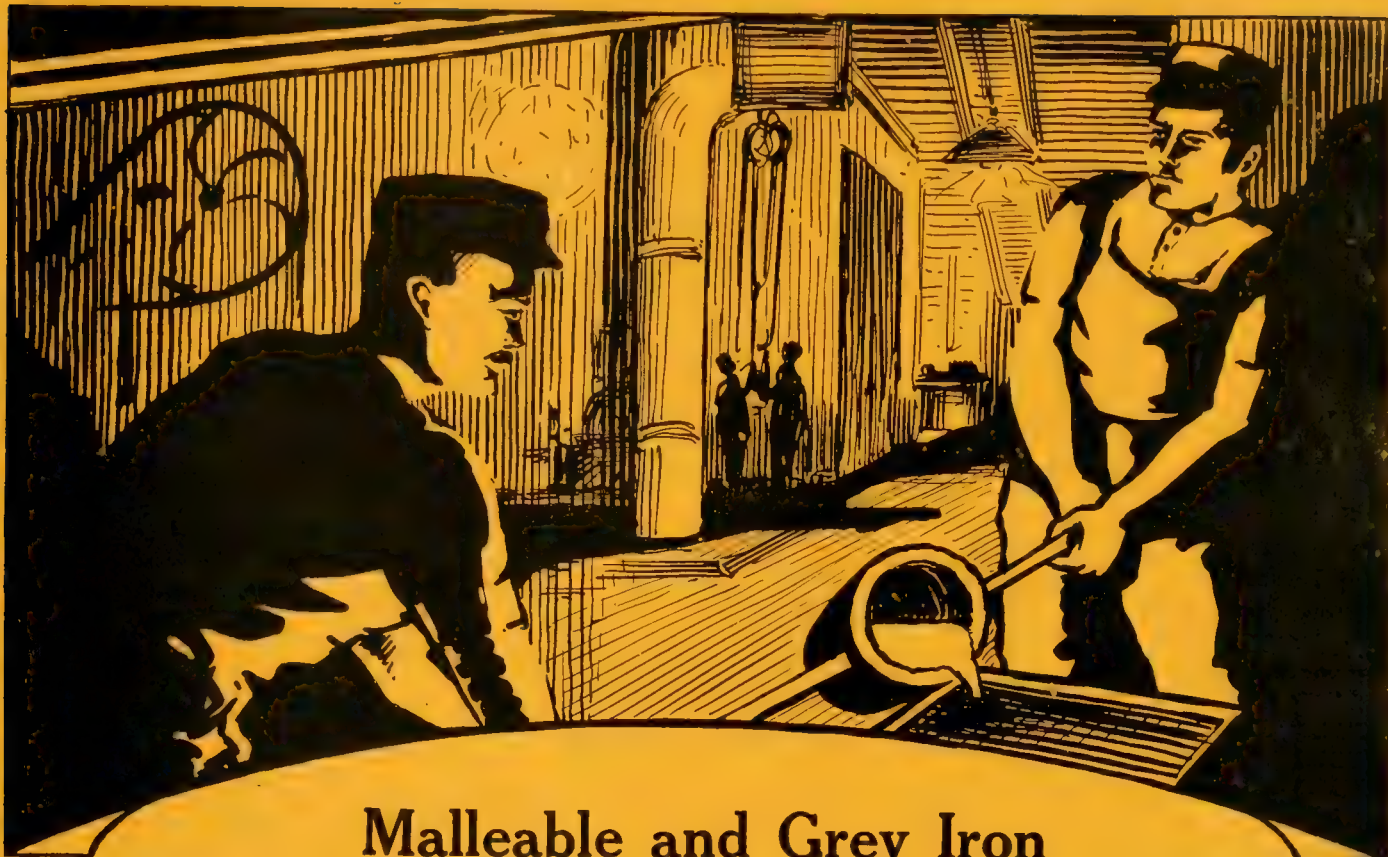
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe

International Malleable Iron Co.,



Malleable and Grey Iron

CASTINGS

Also
Malleable
and
Cast Iron
Pipe
Fittings



Large Capacity--Quick Service

The Machinery Manufacturer, the Agricultural Implement Maker, the Automobile Builder, and Specialty Manufacturer—can secure his Malleable and Grey Iron Castings quickly when he orders International Malleable Products. We have the facilities for making exceptionally good deliveries on the largest of orders.

Specify "International Malleable" on your next order for Malleable and Grey Iron Castings, and Malleable and Grey Iron Pipe Fittings.

In addition to quick service you secure reasonable price and quality products.

INTERNATIONAL MALLEABLE IRON COMPANY
LIMITED
GUELPH, ONTARIO, CANADA

Odd, Isn't It

—that some people think of advertising as a means of benefiting only the seller, when its basic function *must be* to render a necessary service to the buyer, else it could not exist. Merchandise lives or dies as it does or does not meet a human need. Advertising is subject to the same law of service. The real measure of its value is what it *gives*, not what it gets.

In the light of these truths, the marvellous growth of advertising in itself, is an impressive demonstration of its essential character in our economic system.

But you are not interested in *all* advertising any more than you are in all merchandise. That is one big reason why you have a highly specialized Business Paper

in your field such as the one carrying this advertisement. It was born of your needs, not of any man's desire to be a publisher.

How It Works for You

What it does for you and your field editorially is self-evident, but its *editorial* service is just as vital. Instead of a buyer having to depend upon gossip, hearsay and dribblets of information from this or that source, he gets it all between two covers.

Timely, authoritative, comprehensive statements about needed materials pass in review as the advertising pages are turned. Confident judgments can be formed, and intelligent decisions made.

Yet advertising is NOT an *added* expense, but an improved distributive process, which takes the place of slower, more costly and less efficient methods.

That is why it pays to *read* advertising even more than it pays to advertise. Especially if you read it in papers which have met the exacting requirements of membership in The Associated Business Papers, Inc., for one of its standards of practice requires that a paper must *decline any advertisement which has a tendency to mislead or which does not conform to business integrity.*

**You are invited to consult us freely about
Business Papers or Business
Paper advertising**

LIST OF MEMBERS

Each has subscribed to and is maintaining the highest standards of practice in its editorial and advertising service.

Advertising and Selling
American Architect
American Blacksmith
American Exporter
American Funeral Director
American Hatter
American Machinist
American Paint Journal
American Paint and Oil Dealer
American Printer
American School Board Journal
Architectural Record
Automobile Dealer and Repairer
Automobile Journal
Automotive Industries
Bakers Weekly
Boiler Maker
Boot and Shoe Recorder
Brick and Clay Record
Buildings and Building Management
Building Supply News
Bulletin of Pharmacy
Canadian Grocer
Canadian Machinery & Mfg. News
Canadian Railway & Marine World
Candy and Ice Cream
Chemical & Metallurgical Engineering
Clothing and Furnisher
Coal Age
Coal Trade Journal
Concrete
Cotton
Daily Metal Trade
Distribution and Warehousing
Domestic Engineering
Dry Goods Economist
Dry Goodsman
Dry Goods Reporter
Electric Railway Journal
Electrical Merchandising
Electrical Record
Electrical World
Embalmers' Monthly
Engineering and Contracting
Engineering and Mining Journal
Engineering News-Record
Factory
Farm Implement News
Farm Machinery—Farm Power
Fire and Water Engineering
Foundry (The)
Furniture Journal
Furniture Manufacturer and Artisan
Furniture Merchants' Trade Journal
Gas Age
Gas Record
Grand Rapids Furniture Record
Haberlasher
Hardware Age
Hardware and Metal

LIST OF MEMBERS (Continued)

Heating and Ventilating Magazine
Hide and Leather
Hospital Management
Hotel Monthly
Hotel Review
Illustrated Milliner
Implement and Tractor Age
Implement & Tractor Trade Journal
Industrial Arts Magazine
Inland Printer
Iron Age
Iron Trade Review
Lumber
Lumber Trade Journal
Lumber World Review
Manufacturers' Record
Manufacturing Jeweler
Marine Engineering
Marine Review
Millinery Trade Review
Mill Supplies
Mining and Scientific Press
Modern Hospital
Motor Age
Motorcycle and Bicycle Illustrated
Motor Truck
Motor World
National Builder
National Petroleum News
Nautical Gazette
Northwest Commercial Bulletin
Northwestern Druggist
Nugent's, The Garment Weekly
Oil News
Oil Trade Journal
Plumber and Steam Fitter
Power
Power Boating
Power Farming Dealer
Power Plant Engineering
Price Current—Grain Reporter
Printers' Ink
Railway Age
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Retail Lumberman
Rubber Age
Shoe Findings
Shoe and Leather Reporter
Shoe Retailer
Southern Engineer
Southern Hardware & Implement Journal
Sporting Goods Dealer
Starchroom Laundry Journal
Tea and Coffee Trade Journal
Textile World
Welding Engineer
Woodworker

THE ASSOCIATED BUSINESS PAPERS, INC.

JESSE H. NEAL, Executive Secretary

HEADQUARTERS:

220 West 42nd Street

NEW YORK CITY

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworth Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Lt.
Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont.

Gages, Thread
Ackworth Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co. L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd.,
Toronto, Ont.
Goodyear Tire & Rubber Co. of Can.,
Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Wel-
land, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto,
Ontario.
Philadelphia Gear Works, Philadelphia,
Pa.

Gear-Cutting Machines
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whitton Machine Co., D. E., New London,
Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.

Gears, Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto,
Ontario.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto,
Ont.
Philadelphia Gear Works, Philadelphia,
Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Hamilton Gear & Machine Co., Toronto,
Ontario.

Gears, Silent Chain
Gardner & Son, Robt., Montreal, Que.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto,
Ontario.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.

Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety

Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd., Windsor, Ont.

Greases, Lubricating

Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs

Ritchey Supply Co., Toronto, Ont.

Grinding Machines

Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Bench

Alkenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Lands Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New
Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.
Rockford Drilling Machine Co., Rockford,
Ill.
Roelefsen Machine & Tool Co., Toronto,
Ont.

Waltham Grinding Wheel Co. of Canada,
Brantford, Ont.

Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A.,
Windsor, Ont.

Wilkinson & Kompass Hamilton Ont.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Grinding Machines, Center

U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Chaser

Jones & Lamson Machine Co., Spring-
field, Vt.

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincin-
nati, Ohio.

Carlock-Walker Mch. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Cylindrical
Carlock-Walker Mch. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield,
Vermont.

Murphy Machine & Tool Co., Detroit,
Mich.

National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Reacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Reacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John,
Dundas, Ont.

Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.

Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.

Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.

Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Grinding Machines, Internal
Carlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Portable

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.
Cincinnati Electrical Tool Co., Cincinnati,
Ohio.
Cleveland Pneumatic Tool Co., Toronto,
Ont.
Carlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Snagging
Blount Co., J. G., Everett, Mass.

Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface

Carlock-Walker Mch. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machines, Thread

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Grinding Machinery, Tool Post

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Carlock-Walker Mch. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Lands Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New
Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefsen Machine & Tool Co., Toronto,
Ont.
Waltham Grinding Wheel Co. of Canada,
Brantford, Ont.

Grinding Wheels

Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico,
Ont.

Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada,
Ltd., Brantford, Ont.

Guards, Emery Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton,
Ont.

Guards, Electric Lamp
Flexible Steel Lacing Co., Chicago, Ill.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworth Ltd., John, Birmingham, Eng.

Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Carlock-Walker Mch. Co., Toronto, Ont.

Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Starrett Co. L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto,
Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John,
Dundas, Ont.

Bliss Co., E. W., Brooklyn, N.Y.
Brown, Rogers & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Wel-
land, Ont.

Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Alkenhead Hardware Ltd., Toronto, Ont.

Brown, Rogers & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Cleveland Pneumatic Tool Co., Toronto,
Ont.

Carlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Keller Pneumatic Tool Co., Grand
Haven, Mich.

Hammers, Power
Bertram & Son Co., Ltd., The John,
Dundas, Ont.

Brown, Rogers & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Hammers, Rivetting
Cleveland Pneumatic Tool Co., Toronto,
Ont.

Hangers, Shafting

Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co.,
Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto,
Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Heating
Skinner Bros. Mfg. Co., Inc., St. Louis,
Mo.

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong-Whitworth of Canada, Ltd.
Montreal, Canada.

Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd.
Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Carlock-Walker Mch. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.

Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co.,
Montour Falls, N.Y.

Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.

Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.

Wright Mfg. Co., Lisbon, Ohio.

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Curtis Pneumatic Machinery Co., St.
Louis, Mo.
Carlock-Walker Mch. Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara
Falls, Ont.

Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Cleveland Pneumatic Tool Co., Toronto,
Ont.

Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, Flexible Steel
Can. Fairbanks-Morse Co., Ltd., Montreal.

Ontario Metal Products Co., Ltd., Tor-
onto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd.,
Toronto, Ont.

Goodyear Tire & Rubber Co. of Can.,
Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd.,
Montreal, Que.

Can. Foamite Firefoam Co., Hamilton,
Ont.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester,
Mass.

Hydraulic Machinery
Bertram & Son Co., Ltd., The John,
Dundas, Ont.

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Carlock-Walker Mch. Co., Toronto, Ont.

Stewart & Co., Duncan, Glasgow, Sco.

Hydrogen
National Electro Products, Ltd., Toronto,
Ont.

Index Centers
Dickow, Fred. C., Machinery Co., Chi-
cago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Wel-
land, Ont.

Indicators, Speed and Test
Alkenhead Hardware Ltd., Toronto, Ont.

Atkins & Co., Inc., E. C., Indianapolis, I.

Brown & Sharpe Mfg. Co., Providence, R.I.

Insulation
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.

Jacks, Hydraulic
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.

Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.

Burgess & Marchand, Montreal, Que.

Crescent Machine Co., Ltd., Montreal, Q.

BUYERS' DIRECTORY

Jigs and Fixtures (See Tool Work)
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd.,
Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines

Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mch. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Keys, Machine

Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine

Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Lacing Leather

Clipper Belt Lacer Co., Grand Rapids,
Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric

Federal Eng'g Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments

Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe Pans, Portable

Canada Machinery Corp., Galt, Ont.

Lathe Tools

Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd.,
Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe, Automatic and Semi-Auto-

Armstrong-Whitworth of Canada, Ltd.,
Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield,
Vt.
McDougall Co., Ltd., R. Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathe, Bench

Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Lathe, Boring

Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathe, Chucking (See Lathe, Horizontal Turret, and Lathe, Vertical Turret)

Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield,
Vt.
McDougall Co., Ltd., R. Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathe, Engine

Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.
Garlock-Walker Mch. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R. Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford,
Ill.
Roelofson Machine & Tool Co., Toronto,
Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A.,
Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Lathe, Extension and Gap

Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R. Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathe, Heavy Duty Projectile Boring

Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Williams Machinery & Supply Co., A. R. **Measuring Machines**
Montreal, Que.

Lathe, Horizontal Turret

Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield,
Vt.
McDougall Co., Ltd., R. Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford,
Ill.

Lathe, Polishing (See Polishing and Buffing Machines)

Ford-Smith Machine Co., Hamilton, Ont.

Lathe, Relieving

Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R. Galt, Ont.

Lathe, Universal Hand

Brown & Sharpe Mfg. Co., Providence, R.I.

Lathe, Screw-Cutting

Jones & Lamson Machine Co., Springfield,
Vt.

Lathe, Speed and Hand

Blount Co., J. G., Everett, Mass.
Garlock-Walker Mch. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

Lathe, Spinning

Terry & Co., John C., Birmingham, Eng.

Lathe, Threading

Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathe, Vertical Turret

Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield,
Vt.
Roelofson Machine & Tool Co., Toronto,
Ont.

Lathe, Wood Turning

Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lead Pipe

Steel Co. of Canada, Ltd., Hamilton, Ont.

Lighting Fixtures

Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton,
Ont.

Linoleum Mill Machinery

Bertrams Ltd., Edinburgh, Scotland.

Liquid Air Plants

L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes

Can. Foamite Firefoam Co., Hamilton,
Ont.

Lubricants

Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Lubricating Systems

Bowser, S. F., & Co., Ltd., Toronto, Can.

Machinists' Small Tools

Armstrong-Whitworth of Canada, Ltd.,
Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Wel-
land, Ont.

Can. Fairbanks-Morse Ltd., Montreal

Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Ker & Goodwin Machine Co., Brantford

Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Rapid Tool & Machine Co., Lachine, Que.

Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford,
Ill.

Starrett Co., L. S., Athol, Mass.

Strelinger Co. of Can., Ltd., Chas. A.,
Windsor, Ont.
Wheel Truening Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto,
Ont.

Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel

Can. Steel Foundries, Montreal, Que.

Mandrels, Expanding

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Mandrels, Solid

Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Metals, Alloy

British Smelting & Refining Co., Ltd.,
Montreal, Que.
Brown's Copper & Brass Rolling Mills,
Ltd., Toronto, Ont.

Canada Metal Co., Ltd., Toronto, Ont.

Can. Atlas Crucible Steel Co., Ltd.,
Toronto, Ont.

Can. Steel Foundries, Montreal, Que.

Deloro Smelting & Refining Co., Ltd.,
Toronto, Ont.

Fisher Motor Co., Ltd., Orillia, Ont.

Hoyt Metal Co., Toronto, Ont.

International Nickel Co. of Can., Ltd., Toronto, Ont.

Magnolia Metal Co., Montreal, Que.

Moore & Son, Thos., Montreal, Que.

Pilot Steel & Tool Co., Montreal, Que.

Tallman Brass & Metal, Ltd., Hamilton,
Ontario.

Walker & Sons Metal Products, Ltd.,
Biram, Walkerville, Ont.

Metalite Cloth

Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers

Alkenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments

Ackworth, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati,
Ohio.

Ford-Smith Machine Co., Hamilton, Ont.

Hendey Machine Co., Torrington, Conn.

Kearney & Trecker Co., Milwaukee, Wis.

Kemp Smith Mfg. Co., Milwaukee, Wis.

Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines

Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Milling Machines, Automatic

Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati,
Ohio.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench

Burke Machine Tool Co., Conneaut, Ohio.
Garlock-Walker Mch. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford,
Ill.

Milling Machines, Hand

Burke Machine Tool Co., Conneaut, Ohio.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Rockford Milling Machine Co., Rockford, Ill.

Terry & Co., John C., Birmingham, Eng.

United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type

Bertram & Son Co., Ltd., The John,
Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland,
Ohio.

Ford-Smith Machine Co., Hamilton, Ont.

Gouley Edlund Inc., Cortland, N.Y.

Herbert Ltd., Alfred, Toronto, Ont.

Kearney & Trecker Co., Milwaukee, Wis.

Rockford Milling Machine Co., Rockford,
Ill.

Roelofson Machine & Tool Co., Toronto,
Ont.

Williams Machinery Co., A. R., Toronto,
Ont.

Milling Machines, Plain

Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati,
Ohio.

Cleveland Milling Machine Co., Cleveland,
Ohio.

Ford-Smith Machine Co., Hamilton, Ont.

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Garlock-Walker Mch. Co., Toronto, Ont.

Gouley Edlund Inc., Cortland, N.Y.

Hendey Machine Co., Torrington, Conn.

Herbert Ltd., Alfred, Toronto, Ont.

Kearney & Trecker Co., Milwaukee, Wis.

Kemp Smith Mfg. Co., Milwaukee, Wis.

Petrie, Ltd., H. W., Toronto, Ont.

Rockford Milling Machine Co., Rockford,
Ill.

Terry & Co., John C., Birmingham, Eng.

Milling Machines, Thread

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Milling Machines, Universal

Armstrong-Whitworth of Canada, Ltd.,
Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati,
Ohio.

Ford-Smith Machine Co., Hamilton, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Hendey Machine Co., Torrington, Conn.

Holly, R. S., Toronto, Ont.

Herbert Ltd., Alfred, Toronto, Ont.

Kearney & Trecker Co., Milwaukee, Wis.

Kemp Smith Mfg. Co., Milwaukee, Wis.

Petrie, Ltd., H. W., Toronto, Ont.

Rockford Milling Machine Co., Rockford,
Ill.

Roelofson Machine & Tool Co., Toronto,
Ont.

Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Milling Machines, Vertical

Cincinnati Milling Machine Co., Cincinnati,
Ohio.

Garlock-Walker Mch. Co., Toronto, Ont.

Herbert Ltd., Alfred, Toronto, Ont.

Kearney & Trecker Co., Milwaukee, Wis.

Kemp Smith Mfg. Co., Milwaukee, Wis.

Rockford Milling Machine Co., Rockford,
Ill.

Williams Machinery Co., A. R., Toronto,
Ont.

Monel Metal

International Nickel Co. of Can., Ltd.,
Toronto, Ont.

Motors, Electric

Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mch. Co., Toronto, Ont.

MacGovern & Co., Montreal, Que.

Northern Electric Co., Montreal, Que.

Petrie, Ltd., H. W., Toronto, Ont.

Sturtevant Co., B. F., Boston, Mass.

Williams Machinery Co., A. R., Toronto,
Ont.

Wixons Electric Co., Racine, Wis.

Moulded Rubber Goods

Can. Consolidated Rubber Co., Ltd.,
Montreal, Que.

Nail Machinery

Sleeper & Hartley, Inc., Worcester, Mass.

Nails and Staples

Steel Co. of Canada, Ltd., Hamilton, Ont.

Nickel, Bars, Sheets, Wire, Etc.

International Nickel Co. of Can., Ltd.,
Toronto, Ont.

Nickel Plating Outfits

Walker & Sons Metal Products, Ltd.,
Biram, Walkerville, Ont.

Nickel Silver

Brown's Copper & Brass Rolling Mills
Ltd., Toronto, Ont.

Nitrogen

L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)

Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John,
Dundas, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Greenfield Tap & Die Corp., Galt, Ont.

National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished

Galt Machine Screw Co., Galt, Ont.

Nuts, Machine Screw

Torrington Company, Ltd., Upper Bed-
ford, Que.

Nuts, S.A.E., Plain and Castellated

Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems

Bowser, S. F., & Co., Ltd., Toronto, Can.

Oil Storage Engineers

Bowser, S. F., & Co., Ltd., Toronto, Can.

Oils

Canadian Oil Companies, Ltd., Toronto,
Ont.

Cateract Refining Co., Toronto, Ont.

Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co. Ltd.
Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co.,
Roston, Mass.

Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia,
Pa.

Williams Machinery Co., A. R., Toronto,
Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines

Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Landis & Co. A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchy Machine & Tool Co., Detroit,
Mich.

McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Alkenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Platen-Ring Machines
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John
Dundas, Ont.

Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Garlock-Walker Mch. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto,
Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John
Dundas, Ont.

Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John
Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sher-
brooke, Que.

Cleveland Pneumatic Tool Co., Toronto,
Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand
Haven, Mich.

Polishing and Buffing Machines
Ackworth Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.

Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd.,
Toronto, Ont.

Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pots, Steel
Swedish Crucible Steel Co. of Canada,
Ltd., Windsor, Ont.

Pressed Steel Parts
Ackworth Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal,
L. & P. Manufacturing Company, Ltd.,
Niagara Falls, Ont.

National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A.,
Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Wel-
land, Ont.

Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John
Dundas, Ont.

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto,
Ont.

Presses, Power

Bills Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw

Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines

Alkenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Protractors

Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers

Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert

American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Positive Clutch & Pulley Works, Toronto,
Ont.

Pulleys, Metal and Fibre

American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville,
Que.

Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd.,
Toronto, Ont.

Johnson Machine Co., Carlyle, Manches-
ter, Conn.

Kennedy & Sons, Wm., Owen Sound, Ont.

Williams Machinery & Supply Co., A. R.,
Montreal, Que.

Pulp and Paper Mill Equipment

MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire

Tallman Brass & Metal, Ltd., Hamilton,
Ont.

Pumps, Barrel and Boiler-feed

Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant

Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand

Trahern Pump Co., Rockford, Ill.

Pumps, Industrial

Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic

Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Que.

Electric Steel & Engineering Co., Wel-
land, Ont.

Hepburn Ltd., John T., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.

Stewart & Co., Duncan, Glasgow, Scot.

Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil

Bowser, S. F., & Co., Ltd., Toronto, Can.

Can. Blower & Forge Co., Ltd., Kitchener.

Hepburn Ltd., John T., Toronto, Ont.

McDougall Co., Ltd., R., Galt, Ont.

Trahern Pump Co., Rockford, Ill.

Pumps, Power

Bowser, S. F., & Co., Ltd., Toronto, Can.

Can. Blower & Forge Co., Ltd., Kitchener.

Can. Fairbanks-Morse Ltd., Montreal, Q.

Can. Ingersoll-Rand Co., Ltd., Sher-
brooke, Que.

Hepburn Ltd., John T., Toronto, Ont.

Trahern Pump Co., Rockford, Ill.

Punches, Center

Brown & Sharpe Mfg. Co., Providence, R.I.

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Starrett Co., L. S., Athol, Mass.

Punches, Hand

Brown, Boggs & Co., Ltd., Hamilton, Ont.

Can. Blower & Forge Co., Ltd., Kitchener.

Jardine & Co., A. B., Hespeler, Ont.

Punches, Power

Brown, Boggs & Co., Ltd., Hamilton, Ont.

Canada Machinery Corp., Galt, Ont.

Can. Blower & Forge Co., Ltd., Kitchener.

Garlock-Walker Mch. Co., Toronto, Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Toledo Machine & Tool Co., Toledo, Ohio.

Punching Machines, Horizontal

Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric

Bristol Co., Waterville, Conn.

General Combustion Co. of Can., Ltd.,
Montreal, Que.

Walker & Sons Metal Products, Ltd.,
Hiram, Walkerville, Ont.

Racks, Cut

Ford-Smith Machine Co., Hamilton, Ont.

Hamilton Gear & Machine Co., Toronto,
Ont.

**Racks, Storage (See Furniture,
Machine Shop)**

Brantford Oven & Rack Co., Brantford,
Ont.

Rammers, Foundry

Holden Co., Ltd., Montreal, Que.

Reamer Holders

Cleveland Twist Drill Co., Cleveland, O.

Gisholt Machine Co., Madison, Wis.

Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding

Alkenhead Hardware Ltd., Toronto, Ont.

Can. Detroit Twist Drill Co., Walker-
ville, Ont.

Cleveland Twist Drill Co., Cleveland, O.

Gisholt Machine Co., Madison, Wis.

Greenfield Tap & Die Corp., Galt, Ont.

Ingersoll Machine & Tool Co., Ltd.,
Ingersoll, Ont.

McCroskey Tool Corp., Meadville, Pa.

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Reamers, Solid

Armstrong Whitworth Co. of Can., Ltd.,
Montreal, Que.

Butterfield & Co., Inc., Rock Island, Que.

Can. Detroit Twist Drill Co., Walker-
ville, Ont.

Cleveland Twist Drill Co., Cleveland, O.

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Greenfield Tap & Die Corp., Galt, Ont.

Ingersoll Machine & Tool Co., Ltd.,
Ingersoll, Ont.

Morse Twist Drill & Machine Co., New
Bedford, Mass.

Reamers, Taper

Butterfield & Co., Inc., Rock Island, Que.

Can. Detroit Twist Drill Co., Walker-
ville, Ont.

Cleveland Twist Drill Co., Cleveland, O.

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Garlock-Walker Mch. Co., Toronto, Ont.

Gisholt Machine Co., Madison, Wis.

Greenfield Tap & Die Corp., Galt, Ont.

Ingersoll Machine & Tool Co., Ltd.,
Ingersoll, Ont.

Morrow Screw & Nut Co., Ltd., John,
Ingersoll, Ont.

Pilot Steel & Tool Co., Montreal, Que.

Pratt & Whitney Co., of Canada, Ltd.,
Dundas, Ont.

Resorders, Temperature

Taylor Instrument Co., Rochester, N.Y.

Walker & Sons Metal Products, Ltd.,
Hiram, Walkerville, Ont.

Recorders, Time

Gisholt Machine Co., Madison, Wis.

International Business Machines Co., To-
ronto, Ont.

**Regulators, Automatic (for electric
furnaces)**

Volta Mfg. Co., Welland, Ont.

Rheostats

Northern Electric Co., Montreal, Que.

Resistance Materials

Walker & Sons Metal Products, Ltd.,
Hiram, Walkerville, Ont.

Respirators

Willson Goggles, Inc., Reading, Pa.

Rivets

Parmenter & Bulloch Co., Gananoque,
Ont.

Steel Co. of Canada, Ltd., Hamilton, Ont.

Torrington Company, Ltd., Upper Bed-
ford, Que.

Rivet Heaters

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

General Combustion Co. of Can., Ltd.,
Montreal, Que.

Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery

Acme Machinery Co., Cleveland, Ohio.

Bertram & Son Co., Ltd., The John
Dundas, Ont.

National Machinery Co., Tiffin, Ohio.

Riveting Machines

Bilton Machine Co., Bridgeport, Conn.

Can. Fairbanks-Morse Co., Ltd., Montreal.

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

High Speed Hammer Co., Rochester, N.Y.

Holden Co., Ltd., Montreal, Que.

Independent Pneumatic Tool, Chicago, Ill.

Keller Pneumatic Tool Co., Grand Haven,
Mich.

Parmenter & Bulloch Co., Gananoque,
Ont.

Petrie, Ltd., H. W., Toronto, Ont.

Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment

Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)

Can. Consolidated Rubber Co., Ltd.,
Montreal, Que.

Rudder Frames, Steel

Can. Steel Foundries, Montreal, Que.

Dominion Foundries & Steel, Ltd., Ham-
ilton, Ont.

Rubber Goods, Mechanical

Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel

Chesterman & Co., Ltd., J., Sheffield, Eng.

Rules, Steel and Wood

Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives

Oakley Chemical Co., New York, N.Y.

Sand Equipment

Can. Link-Belt Co., Toronto, Ont.

Sand Mills

Frost Mfg. Co., Chicago, Ill.

Sanding Machinery

Oliver Machy. Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,
Que.

Cleveland Pneumatic Tool Co., Toronto,
Ont.

Holden Co., Ltd., Montreal, Que.

Independent Pneumatic Tool, Chicago, Ill.

Keller Pneumatic Tool Co., Grand Haven,
Mich.

Saw Frames and Blades, Hack

Alkenhead Hardware Ltd., Toronto, Ont.

Atkins & Co., Inc., E. C., Indianapolis, I.

Clemson Bros., Inc., Hamilton, Ont.

Diamond Saw & Stamping Works, Hur-
falo, N.Y.

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Rice Lewis & Son, Ltd., Toronto, Ont.

Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal

Atkins & Co., Inc., E. C., Indianapolis, I.

Foss Machinery & Supply Co., Geo. F.,
Montreal, Que.

Herbert Ltd., Alfred, Toronto, Ont.

Lyman Tube & Supply Co., Montreal, Que.</

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn.

Screw Machines
Brown & Sharpe Mfg. Co., Providence, R. I.

Screw Machines, Automatic
Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.

Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

Screw Machine Products
Torrington Company, Ltd., Upper Bedford, Que.

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Lock Cap
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Safety Flat
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Screws, Side Knob
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Thumb
Torrington Company, Ltd., Upper Bedford, Que.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont.

Separators, Moisture and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser, S. F., & Co., Ltd., Toronto, Can.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.

Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefsen Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
& Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland.

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mch. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist, Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kemp Smith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
British Smelting & Refining Co., Ltd., Montreal, Que.
Host Metal Co., Toronto, Canada.

Snap Flasks
Oliver Machy Co., Grand Rapids, Mich.

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Specialties, Swaged and Headed Work
Torrington Company, Ltd., Upper Bedford, Que.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

Spring-making Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R. I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont.

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Alliquippa, Pa.

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Alliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Alliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I.

Switches, Railway
Can. Steel Foundries, Montreal, Que.

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

Tanks and Pumps, Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Ackworth, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Ackworth, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.

Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murphy Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murphy Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threaded Wires
Torrington Company, Ltd., Upper Bedford, Que.

Threading Machines
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murphy Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton & Leasing Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Truing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

Torches, Blow

National Electro Products, Ltd., Toronto, Ont.
 Perdue, W. B., San Francisco, Calif.
 Prest-O-Lite Co. of Can., Toronto, Ont.
 Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway

Can. Steel Foundries, Montreal, Que.

Trackwork, Manganese Steel

Can. Steel Foundries, Montreal, Que.

Transformers

Northern Electric Co., Montreal, Que.

Transmission Machinery

Bernard Industrial Co., A., Fortierville, Que.
 Can. Link-Belt Co., Toronto, Ont.
 Garlock-Walker Mch. Co., Toronto, Ont.
 Jones & Glasco, Montreal, Que.
 Kennedy & Sons, Wm., Owen Sound, Ont.
 Petrie, Ltd., H. W., Toronto, Ont.
 Positive Clutch & Pulley Works, Toronto, Ont.
 Renold (Hans) of Canada, Ltd., Montreal, Que.

Transportation Systems (See Trucks)

Mathews Gravity Carrier Co., Port Hope, Ont.

Treated Bits

Can. Atlas Crucible Steel Co., Toronto, Ont.
 Vanadium Alloys Steel, Latrobe, Pa.

Trolleys and Tramways

Can. Link-Belt Co., Toronto, Ont.
 Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
 Northern Crane Works, Walkerville, Ont.
 Wright Mfg. Co., Lisbon, Ohio.

Trucks

Can. Fairbanks-Morse Ltd., Montreal, Q.
 Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
 Hepburn Ltd., John T., Toronto, Ont.
 Maple Leaf Mfg. Co., Montreal, Que.
 Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
 National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor

Maple Leaf Mfg. Co., Montreal, Que.
 National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products

Tube Co. of Canada, Toronto, Ont.

Tubing, Electric Welded or Oxy-Acetylene Welded

Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
 Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel

Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre

Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
 Dom. Steel Products Co., Brantford, Ont.
 Lyman Tube & Supply Co., Montreal, Que.
 Ontario Metal Products Co., Ltd., Toronto, Ont.
 Tallman Brass & Metal Co., Hamilton, Ont.

Tubing, Welded

International Nickel Co. of Can., Ltd., Toronto, Ont.
 Ontario Metal Products Co., Ltd., Toronto, Ont.

Tubing, Welded Steel

Tube Co. of Canada, Toronto, Ont.

Turbines, Water

Kennedy & Sons, Wm., Owen Sound, Ont.

Turret Heads

Ackworth, Ltd., John, Birmingham, Eng.
 Bertram & Son Co., Ltd., The John, Dundas, Ont.

Turret Machines (See Lathes, Horizontal Turret)

Acme Machine Tool Co., Cincinnati, Ohio.
 Cook Co., Asa S., Hartford, Conn.
 Gisholt Machine Co., Madison, Wis.
 Jones & Lamson Machine Co., Springfield, Vermont.

National Acme Co., Cleveland, Ohio.
 Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Steinle Turret Machine Co., Madison, Wis.
 Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post

Gisholt Machine Co., Madison, Wis.

Unions, Pipe

Crane Ltd., Montreal, Que.

Universal Joints

Fort-Smith Machine Co., Hamilton, Ont.

Holden Co., Ltd., Montreal, Que.

BUYERS' DIRECTORY

Valves

Can. Fairbanks-Morse Ltd., Montreal, Q.
 Cleveland Pneumatic Tool Co., Toronto, Ont.
 Crane Ltd., Montreal, Que.
 Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
 Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Vices, Drilling Machine

Hoosier Drilling Mach. Co., Goshen, Ind.
 Kempsmith Mfg. Co., Milwaukee, Wis.

Vices, Metal Workers'

Alkenhead Hardware, Ltd., Toronto, Ont.
 Columbia Hdwe. Division, Cleveland, O.

Vices, Milling Machine

Brown & Sharpe Mfg. Co., Providence, R.I.
 Crescent Machine Co., Ltd., Montreal, Q.
 Ford-Smith Machine Co., Hamilton, Ont.
 Hendey Machine Co., Torrington, Conn.
 Hoosier Drilling Mach. Co., Goshen, Ind.
 Kearney & Trecker Co., Milwaukee, Wis.
 Kempsmith Mfg. Co., Milwaukee, Wis.

Victor Tool Co., Waynesboro, Pa.

Parmenter & Bulloch Co., Gananoque, Ont.

Voltmeters

Bristol Co., Waterbury, Conn.
 Northern Electric Co., Montreal, Que.

Wagon Leaders

Can. Link-Belt Co., Toronto, Ont.

Washers

Barnes Co., Wallace, Bristol, Conn.
 Diamond State Fibre Co., Toronto, Ont.
 Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
 Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
 Graton & Knight Mfg. Co., Worcester, Mass.
 McLaren Belting Co., J. C., Montreal, Que.
 Steel Co. of Canada, Ltd., Hamilton, Ont.
 Torrington Company, Ltd., Upper Bedford, Que.

Welding Machines, Oxy-Acetylene

Davis-Bournonville Co., Jersey City, N.J.
 Holden Co., Ltd., Montreal, Que.
 L'Air Liquide Society, Toronto, Ont.
 Perdue, W. B., San Francisco, Calif.
 Prest-O-Lite Co. of Can., Toronto, Ont.

Welding, Oxy-Acetylene

Carter Welding Co., Toronto, Ont.
 Davis-Bournonville Co., Jersey City, N.J.
 Holden Co., Ltd., Montreal, Que.
 Lincoln Electric Co., Toronto, Ont.
 National Electro Products, Toronto, Ont.
 Prest-O-Lite Co. of Can., Toronto, Ont.
 Union Carbide Co. of Can., Welland, Ont.

Welding Rod, Tobin, Manganese Bronze and Aluminum

Tallman Brass & Metal, Ltd., Hamilton, Ont.

Welding Supplies

British Smelting & Refining Co., Ltd., Montreal, Que.
 Carter Welding Co., Toronto, Ont.
 Davis-Bournonville Co., Jersey City, N.J.
 L'Air Liquide Society, Toronto, Ont.
 Lincoln Electric Co., Toronto, Ont.
 National Electro Products, Toronto, Ont.
 Perdue, W. B., San Francisco, Calif.
 Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
 Union Carbide Co. of Can., Welland, Ont.

Wheels, Cast, Steel

Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Wheels, Industrial

American Pulley Co., Philadelphia, Pa.
 Hull Iron & Steel Foundries, Hull, Que.
 Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Electric

Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
 Volta Mfg. Co., Welland, Ont.

Winches, Headgate

Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog

Kennedy & Sons, Wm., Owen Sound, Ont.

Wire

Barnes Co., Wallace, Bristol, Conn.
 Canada Metal Co., Ltd., Toronto, Ont.
 Dennis Wire & Iron Works, London, Ont.
 Greening Wire Co., B., Hamilton, Ont.
 Northern Electric Co., Montreal, Que.

Wire Cloth

Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Coiling Machinery

Sleeper & Hartley, Inc., Worcester, Mass.

Wire Rope

Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Straightening and Cutting Machinery

Baird Machine Co., Bridgeport, Conn.
 Brown, Boggs & Co., Ltd., Hamilton, Ont.
 Schuster Co., F. B., New Haven, Conn.
 Sleeper & Hartley, Inc., Worcester, Mass.

Wire, Welding

L'Air Liquide Society, Toronto, Ont.
 National Electro Products, Ltd., Toronto, Ont.
 Perdue, W. B., San Francisco, Calif.
 Prest-O-Lite Co. of Can., Toronto, Ont.
 Tallman Brass & Metal Co., Hamilton, Ont.

Wires, Special

Dennis Wire & Iron Works, London, Ont.
 Greening Wire Co., B., Hamilton, Ont.
 Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Woodworking Machinery

Canada Machinery Corp., Galt, Ont.
 Can. Fairbanks-Morse Co., Ltd., Montreal.
 Garlock-Walker Mch. Co., Toronto, Ont.
 Oliver Machinery Co., Grand Rapids, Mich.
 Williams Machinery Co., A. R., Toronto, Ont.

Wrenches, Drop Forged

Armstrong Bros. Tool Co., Chicago, Ill.
 Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Machinists'

Armstrong Bros. Tool Co., Chicago, Ill.
 Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe

Canada Foundries & Forgings Co., Welland, Ont.
 Crane Ltd., Montreal, Que.
 Greenfield Tap & Die Corp., Galt, Ont.

Wrenches, Tap

Butterfield & Co., Inc., Rock Island, Que.
 Greenfield Tap & Die Corp., Galt, Ont.

Wrought Iron Pipe

Steel Co. of Canada, Ltd., Hamilton, Ont.

DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
 The Canadian Fairbanks-Morse Co., Montreal, Que.
 The Garlock-Walker Machinery Co., Toronto, Ont.
 R. S. Holly, Toronto, Ont.
 H. W. Petrie Limited, Toronto, Ont.
 The Standard Equipment & Tool Co., Montreal, Que.

MACHINE SHOP AND

Chas. P. Archibald & Co., Montreal, Que.
 The Canadian Fairbanks-Morse Co., Montreal, Que.
 The Garlock-Walker Machinery Co., Toronto, Ont.
 R. S. Holly, Toronto, Ont.
 H. W. Petrie Limited, Toronto, Ont.
 The Standard Equipment & Tool Co., Montreal, Que.

POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
 MacGovern & Co., Montreal, Que.
 H. W. Petrie Limited, Toronto, Ont.

WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
 The Canadian Fairbanks-Morse Co., Montreal, Que.
 The Garlock-Walker Machinery Co., Toronto, Ont.
 R. S. Holly, Toronto, Ont.

Vices, Pipe

Columbia Hdwe. Division, Cleveland, O.
 Greenfield Tap & Die Corp., Galt, Ont.

Vices, Planer and Shaper

Bertram & Son Co., Ltd., The John, Dundas, Ont.
 Hendey Machine Co., Torrington, Conn.
 Hoosier Drilling Mach. Co., Goshen, Ind.
 Kempsmith Mfg. Co., Milwaukee, Wis.
 McDougall Co., Ltd., R., Galt, Ont.
 Superior Machine Co., London, Ont.

Vices, Wood Workers'

Columbia Hdwe. Division, Cleveland, O.
 Foss Machinery & Supply Co., Geo. F., Montreal, Que.
 Oliver Machy. Co., Grand Rapids, Mich.

Washers, Rubber

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene

L'Air Liquide Society, Toronto, Ont.

Welding, Electric

All-Weld Company, Toronto, Ont.
 Carter Welding Co., Toronto, Ont.
 Lincoln Electric Co., Toronto, Ont.
 National Electro Products, Toronto, Ont.

Welding Filler Rods

L'Air Liquide Society, Toronto, Ont.
 National Electro Products, Ltd., Toronto, Ont.
 Perdue, W. B., San Francisco, Calif.
 Prest-O-Lite Co. of Can., Toronto, Ont.

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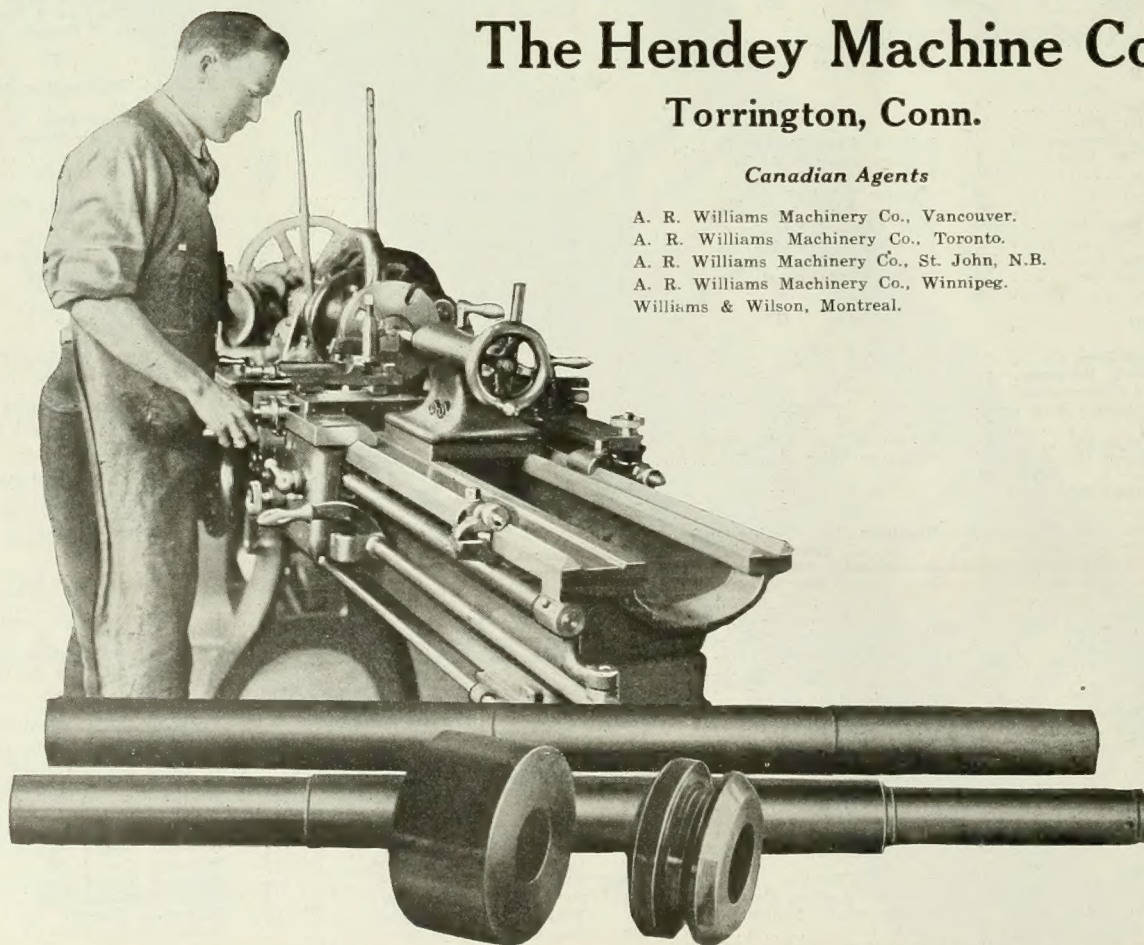
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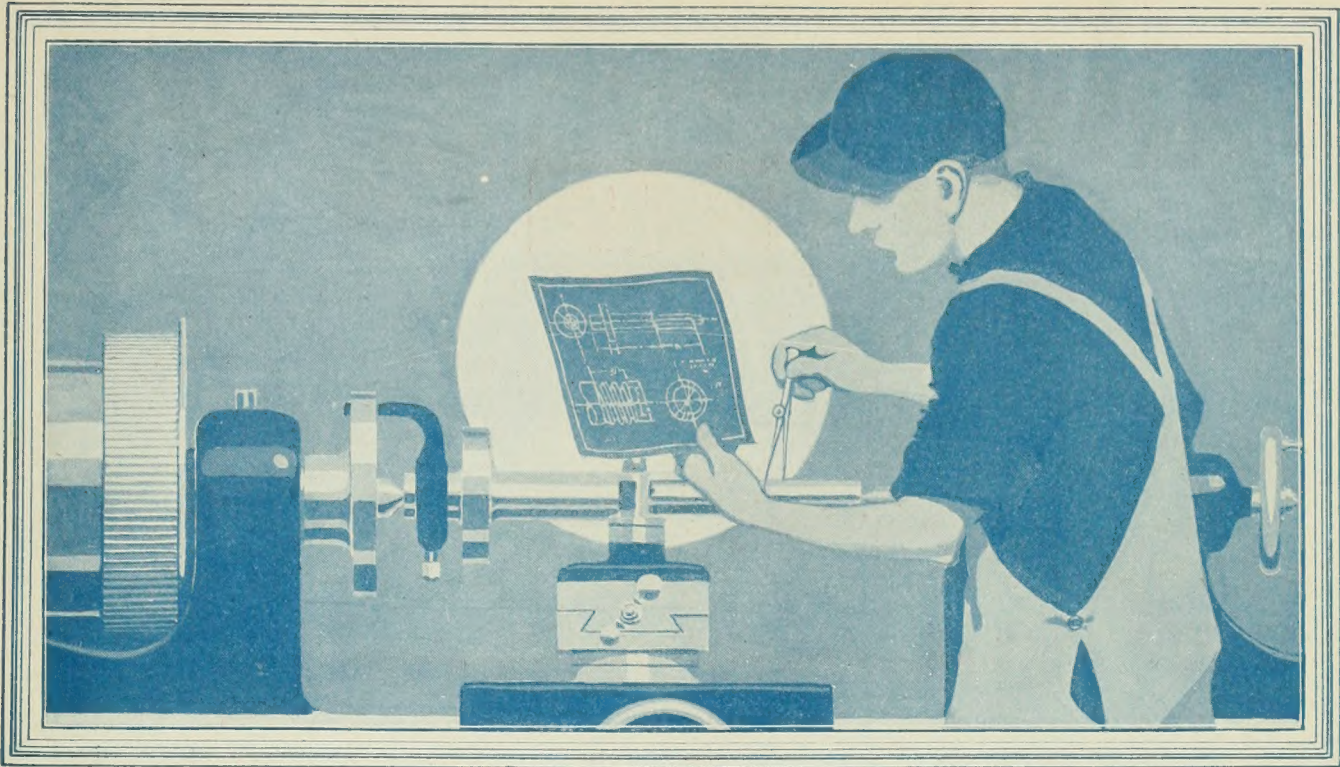
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